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EDITORIAL NOTES.

We have devoted a large amount of space in this issue to abstracts from the proceedings of the British Guiana Farmers' Conference held in August, in order that farmers throughout the Colony might have the opportunity of perusing the very instructive addresses by the various speakers at the Conference. If we are to use the inspiring speeches at this Conference as a criterion, then we may rest assured that an agricultural awakening is taking place in the Colony.

The Government Fruit, Vegetables and Produce Depôt referred to in our last issue is now an accomplished fact, and the amount of patronage given to it both by the farmer and the consumer has already shown that the necessity for such an agency was a very real and pressing one. We take this occasion to remind our farmers, using the words of Mr. F. A. Mackey, " that it is entirely up to them to make it a success or a failure."

By inviting Mr. S. M. de Freitas to speak on " Cattle Rearing," the Conference seems to have made a very happy choice. One cannot read his address without realizing that, in so far as the breeding of cattle is concerned, whether it be from the point of view of producing beef or for the purpose of increasing our milk supply, this Colony is very

backward. This we feel is due as much to indifference and lack of knowledge, as it is to the absence of a spirit of co-operation on the part of cattle owners. We trust that the advice given will be taken to heart by those concerned, and that in the near future, the quality and quantity of the beef produced in this Colony will be greatly improved.

The question of Pine-apple Cultivation was dealt with by the Hon. Hector Josephs in a very practical manner. We endorse his statement as to the suitability of the soil conditions in the highlands of the North West District for growing this crop. We are also of the opinion that the cultivation of pine-apples on a large scale in this Colony is *a matter which requires very careful consideration.*

In connection with the article by Mr. T. A. Archer on "The Cultivation of Tobacco," we would like to point out that it is not the suitability of the various kinds of soils which has to be considered in this Colony, but the favourableness or otherwise of the climate with regard to curing the product. It was this factor that caused previous growers to abandon their somewhat extensive experiments with this crop. It is creditable that Mr. Archer has actually grown and "cured" a tobacco which is considered by smokers to be quite good. All tobacco grown here would have to be cultivated as a garden crop, and not extensively, as this would require a large capital and a numerous labour force which, at present, is not available. Here and there in certain parts of the Rupununi Savannahs tobacco is grown, and small areas of land, (*e.g.* the sites of abandoned factories, etc.,) are also found suitable. These small areas can be profitably exploited, but as an Industry, we are afraid it has nothing to recommend it so far as the coastlands are concerned.

B. G. FARMERS' CONFERENCE.

TENTH ANNUAL SESSION.

The 10th Annual Session of the B. G. Farmers' Conference was held at the Wesleyan School Hall, Mahaicony, on the 24th August, 1926. The Session was opened by Hon. J. Hampden King, acting Colonia Secretary.

On the platform were Mr. H. A. Britton, Presiden of the Conference, Hon. J. J. DaSilva, Revs. W. E Giddings, W. A. Deane; Messrs. Edwin Bacchus, J.P. A. K. Amin, B.A., L.L.B., C. R. Williams, R. McArthu (President of the Mahaicony Farming Association), Di S. N. Bruce (acting Government Veterinary Surgeon E. M. Morgan and C. C. Dowding (Agricultural Instru tors) and the following delegates:—Messrs. D. D. Haynes, R. McArthur, E H. Underwood, A. Rohoman, J. E. Palmer (Bagotville), Rev. W. A. Deane and Mr. D. P. C. Lambert.

PRESIDENTIAL ADDRESS.

After the usual opening exercises, the President delivered the following address :—

Officers, accredited Delegates of Associations and Friends :—

Once again it is my privilege to address you as the Chairman and pleasant as that duty was in the past it is the greater to-day not only because the major difficulty is being tackled, but more so because drainage, a fundamental to successful farming will in the not distant future be an accomplished fact. Moreover, at no previous time in the history of the colony has the outlook for his position been so roseate to the small farmer

The Late Director.

Following upon intermittent attacks and a painfully severe illness, Professor Sir John Burchmore Harrison, C.M.G., M.A., F.I.C., F.G.S., etc., for many years the talented and respected head of the Department of Science and Agriculture died in the Lady Thompson Ward, Public Hospital, Georgetown, on 8th February last. The outstanding characteristic of the late head of the Colony's Agricultural Department was his strict honesty of purpose and unselfish devotion to his multifarious duties.

Our New Director.

During July the Governor Sir Cecil Hunter Rodwell was intimated by the Secretary of State for the Colonies that Mr. W. Nowell of Trinidad, was appointed as successor to the late Sir John Harrison as Director of Science and Agriculture. Mr. Nowell is expected to assume the duties of his office on 1st November next and he is assured of the loyal support and hearty co-operation of this Conference, the various County and District Associations and small farmers scattered over the length and breadth of the colony. It is well that opportunity be taken to warn one and all not to expect too much of Mr. Nowell who will have cast upon him as he enters upon his duties the remodelling of the Department to bring it in line with those of other progressive colonies.

That Old Friend.

Mr. R. Ward, O.B.E., went on leave of absence early the year with permission to retire at the expiration of his leave. This Conference wishes for its old, true and trusted friend many years of life in the enjoyment of his well earned pension. On it becoming known that Mr. Ward will retire the Executive Committee acting on

behalf of Conference, passed, and the Secretary forwarded to Government a resolution regarding the class and type of person to be appointed as successor of Mr. Ward. For that resolution I plead with the Governor for sympathetic consideration. Moreover it is a reproach to the Government to have any trained scientific officer engaged in purely clerical duties.

GOVERNMENT PRODUCE AGENCY.

United agitation for years by the Village Chairmen's and this Conference failed where a memorandum by Mr. G. D. Owen, Assistant Colonial Secretary, succeeded in getting Government to move and the Combined Court to vote a sum considered necessary for the establishment of a Produce Agency under Government supervision. A Committee has been set up to work that latest innovation, but the opinion has been expressed that not only is the Agency being launched at an inopportune time but that the Committee charged with its working, is incomplete in that it lacks a representative of the Chamber of Commerce and a representative of the small farmers for whom the Agency ostensibly intended to benefit. The task which faces the Committee is by no means enviable because of a reported determination on the part of the middle-men in the Stabroek Market and elsewhere to combine with a view to bringing about the failure of the Government Produce Agency.

ACTION AND NOT TALK.

The very sane and practical address by Mr. Mackey already referred to has been productive of some good despite the continued marking time policy on the part of Government. Several persons in various districts planted patches of ground nut, which in some instances got burnt by fire, and in others scorched during the recent protracted drought. In one instance for the first time, as far as ascertainable, an acre or thereabout was put under Black Eye Pease cultivation which when the June rains descended in torrents was flooded out. Moreover, never before has there been such a demand on the Botanic Gardens for Economic and other Permanent Plants than at the present

moment. This is encouraging in so far as the future is concerned, notwithstanding that presently there is no sustained supply of fruits for local demand nor can any reliable information be procured, regarding the area under cultivation of the various fruits. Time was when Jamaica the premier fruit growing colony of the West Indies was in no better position than we presently find ourselves ; but to-day that trade is so fully organized as to render procurable the acreage under cultivation with but little or no trouble. It is therefore not too much to expect that before the end of this quinquennial period in the matter of information regarding the area under cultivation of fruits and other crops this colony will be in the same position as Jamaica.

Farmers Challenged.

By way of its earnest desire to co-operate with and assist the small farmers in the disposal of their fruits and to encourage people to eat more fruit, colony's premier firm, Messrs. Booker Bros., McConnell & Co., Ltd., have made suitable arrangements at their Amalgamated Groceries Department to handle Grape Fruits, Pine Apples, Oranges, Shaddocks, Pears and other fruits, provided however, the fruits are of a certain standard and the producers of those fruits do not themselves or by their agents sell cheaper to others than to them. This magnanimous offer should not only be an incentive to the small farmers to produce the best but a challenge to them all to take their fruits to Mr. W. I. Rugman, the approachable manager of the Amalgamated Groceries from whom they get a straight deal and prompt payment, what time fruits are taken.

It but now remains for me in the most emphatic manner and in language that admits of no equivocation to enjoin all farmers to take their Grape Fruits, Oranges, Pine Apples and Shaddocks, also Pea-nuts and Black Eye Pease to Bookers Amalgamated Groceries since it was left to Mr. F. A. Mackey, a director of Messrs. Booker Bros., McConnell & Co., Ltd., to be the first person in a practical manner to bring about closer relationship between a com-

mercial house and the small farmer in the articles named and thus is laid the foundation upon which can be built an Export Fruit Trade.

Expermental Stations.

Subsequent to the adoption by the Board of Agriculture of the scheme for the establishment of three 100-acre Experimental Stations, a joint meeting of representatives from the Chamber of Commerce, the British Guiana Sugar Planters' Association and the British Guiana Farmers' Conference was held in the Exchange Rooms, Museum Buildings, on Thursday, 5th November, 1925, to discuss at the request of our Conference "The possibility of developing a Local or Export Fruit Trade as well as to investigate any other grounds whereby the small farmer may be encouraged to make some contribution to the general industrious well-being of the colony." At the meeting there were present Messrs. C. Farrar, President of the Chamber of Commerce, who presided, F. A. Mackey, M. B. G. Austin and E. M. Walcott, F.R., representing the Chamber of Commerce and the B. G. Sugar Planters' Association, and Messrs. R. Reuben Baird, Edward Isaacs and myself, representing Conference. The report of the joint committee which was highly favourable in point of fact, endorsed in principle the scheme approved of by the Board of Agriculture and with all the Executive Government appears to be still at its game of procrastination rather than rushing to give opportunity to the small farmer to make hay while the sun shineth. Though as a Conference we have abstained from dabbling in politics it would be nothing short of a suicidal policy should steps not be taken through voters—members of affiliated Associations, to exact a promise from aspirants for political honours at the forthcoming General Elections that should Government not insist in the next annual estimate the sum estimated as being required for establishment of the first hundred acres Expermental Station that a resolution recommending the insertion of the amount be tabled and to be unanimously supported by the Electives.

Poultry.

It is gratifying to record a noticeable improvement of poultry in an important rural district, and I look forward to an infusion in other centres especially as at the present moment with Mr. W. Francis, F.I.C., acting Director of Science and Agriculture, as Chairman, a Committee of the Board of Agriculture is engaged in considering the question of the establishment of a Government Stock Farm.

Anna Regina Venture.

This scheme, launched by the Thomson Government, is still in its embryo stage, and everything should be done by those responsible to inspire the people's confidence in the venture which should be given a fair trial.

Owing to the market, the farmers there and elsewhere in the Colony have experienced very trying times, but they are nevertheless not down-hearted, but instead are hopeful for the future.

General.

From time to time criticisms are being levelled at our farmers for not being possessed of any initiative nor self-reliance, preferring, however, to be looking to and to be dependent on Government. Well, may it be asked of those who criticise the farmers if at any time they have paused and instituted a comparison between farmers here and elsewhere. It is safe to assert that nowhere in the world do farmers labour under the difficulties as our farmers are compelled to fight against. Had the sugar cane not been less susceptible to perish from floods, and despite the subsidy the industry get from the Government, it would have been extinct years ago. The wonder is that without any subvention the local farmers have stood so firm and loyally by a losing game, because of no fault on their part, through recurrent floods and drought.

An enemy more vicious than flood or drought is the Congo Bush now faces the farmers owing to the rapidity with which it is spreading. Its eradication is without doubt beyond the resources of the farmers, hence I invite Government attention to the matter.

Similarly as a grant is given to the Royal Agricultural and Commercial Society, so too ought a grant of say $240·be given this Conference through the Department of Science and Agriculture. The Conference is engaged in doing educative and propaganda work among the small farmers who are slowly but steadily appreciating the work by Conference.

CONCLUSION.

It is hardly neccessary for me, ere I resume my seat, to enjoin delegates to give to the various items on the Agenda the consideration which each on merit deserves at your hands as representatives of the small farmers of British Guiana.

The Chairman, The Hon. J. Hampden King (Acting Colonial Secretary), was introduced by Mr. R. McArthur, Vice-President of the Mahaicony Farmers' Association.

Mr. Hampden King in declaring the meeting open said: "Mr. President, ladies and gentlemen, when I was asked to come here to-day by Mr. Aaron Britton and Mr. Haynes, the first thought which came into my mind was that a meeting such as this will be more properly addressed by one having practical connection and knowledge of agriculture. I regret to say I must hold myself as being very much wanting in both these qualifications but no one who has the interest of the Colony at heart can ignore the fact that agriculture is of vital importance to the community as a whole (applause). It therefore gives me very much pleasure to be here to-day at the 10th annual Conference of the British Guiana Associated District Agricultural Societies, and I think it must be a matter of congratulation to Mahaicony that Mahaicony was selected as the scene of this tenth conference. (Applause). I have on looking through the newspapers noticed that when Mr. Mackey addressed the ninth Conference he pointed out very clearly that as an agricultural community we fell very short of the mark, and not only did we fail to produce from the fields what we should be able to export, but we actually fell short in the sense that we do not produce even enough of the many things which we can easily produce for our own

consumption, and we have to send our money away to the neighbouring islands instead of obtaining them there. I am afraid that one must recognise that that condition prevails more or less to-day but I think that there is ground for believing that there is an awakening. There are many things which I think point in that direction. For instance: take the matter of drainage. There is no doubt about it that for years and years agriculturalists have had to struggle against very adverse circumstances in connection with drainage, but, gentlemen, that position has been tackled, and to a certain extent and in certain districts has been vastly improved. That is a matter for congratulation. Then there is the question of irrigation which in some districts is still a very pressing one indeed. I believe that there has been a little improvement in some districts, but in others there still remains much to be done in this direction. Following on action taken in the Combined Court, a depôt for the handling of vegetables has lately been established. This depôt is at present being conducted by a committee of practical men and it seems to me that although as time goes on we may find certain directions in which improvement may be effected, there is no reason why this institution should not prove of great practical benefit as it has proved itself in neighbouring Colonies. (applause). There is also one other matter which sprang out of action taken in the Combined Court and that is the institution of an Agricultural Loan Bank. That would be a very important thing for agriculture generally when it is got going. It is an indication that all concerned are paying attention to this most important matter of agriculture. This brings me to a point which I think may well be emphasized and that is

The Need for Co-Operation.

When a matter of importance comes up, the obvious and practical course is for all of us to get together and examine the situation in a spirit of determination, sift it thoroughly and come to a definite conclusion on the merits of the "*pros*" and "*cons*." Unfortunately, I am sorry I have to say it but I do say it, we have got into the vicious habit of almost taking an entirely different course. We

pay little or no attention to the merits or demerits but at once divide ourselves into two camps, each more concerned in downing the fellows in the other camp than with the merits of the question involved. That is not a pleasant thing to say but it is there. I am, however, not saying that attitude of mind is confined to any particular section of the Colony, but it has been forced upon one more and more every day that it seems to be universal. I think it is as vicious a course as it is universal. I might say that the Delegation from British Guiana to the West Indian Conference when in London had the good fortune to listen to an admittedly considered authority on Agricultural Organization. I refer to Mr. F. L. McDougall, C.M.G., Australian Representative on the Imperial Economic Committee. Until we had the advantage of hearing Mr. McDougall I do not think one of us had any real understanding as to what an agricultural organisation really meant. We had some hazy idea, but no sound idea as to the many things which go to make up such an organization. I certainly did not. One of the things very clearly put before us was the need for co-operation. From the very beginning—from the time you put the plant into the earth up to the time you market the produce. In connection with the marketing of the produce one of the prime necessities was that nothing should be put on the market which was not what it was intended to be. In other words only the best must be put on the market and that was managed in connection with the Australian business by co-operation among the people themselves. It was their own organization, and they took very good care that none of the members of these different societies ever sent away what was not the prime produce with the result that when they get a market they hold it. I think it is universally acknowledged, that if the producers passed on to the markets which they were lucky enough to get hold of stuff, which does not come up to the standard, the result was they lose those markets. The buyer is not going to worry his head to sort out stuffs, he must be able to depend on his getting what he is told he will get. Bearing somewhat on the question of not working together, we delegates found on two or

three occasions in London when discussing matters—our wants and things of that sort—we were met with the remark, "you say you want so and so, well it does not seem to us you really do know what you want. As far as we make out you seem to occupy your time in quarrelling with each other." That is actually thrown in our teeth, and it all points to the fact that we have been following the wrong course and we ought to do all we can to revise our methods. There is one matter, I think, on which we can congratulate ourselves and that is the new Director of Science and Agriculture, whom we hope to see here shortly, is a gentleman who is primarily an agricultural expert, and I think that is something that we ought to be glad for and something which ought to lead to the improvement of things in the agricultural line which I am perfectly sure we all wish for (applause). If the advancement we all wish for is to take place we must pull together and not apart as we have been doing in the past (applause). It gives me very great pleasure to be here to-day and to see this big representative gathering of farmers and those interested in the land, and I hope that this Conference, as it is the tenth, will not be the last, but that your Association will continue to grow and flourish, and that you will have many more conferences and that all good luck and good fortune will attend you. (Applause), I declare this Conference opened, and in doing that it would have given me the greatest pleasure to remain for the two other sessions, but unfortunately, duty requiries that I should return to headquarters within a very short time. (Cheers).

Replying, the President, Mr. Aaron Britton assured the Colonial Secretary that his presence there that morning was a guarantee that this their 10th annual conference would certainly not be the last and would also be an incentive for still greater determination on the part of the farmers of the Colony to achieve that which he (the Colonial Secretary) had laboured, and laboured successfully that morning, the idea of co-operation. He thanked the Colonial Secretary on Conference's behalf for having declared the Conference open and expressed their appreciation of the straight, plain talk which he had given them.

The B. G. Farmers' Conference concluded its deliberations with a public meeting in the evening in the Mahaicony Scots school-room. Mr. F. A. Mackey presided, and supporting him on the platform were His Worship the Mayor of Georgetown. Hon. R. E. Brassington, Hons. Hector Josephs, K.C., B.A., LL.M., (Attorney General). and F. Dias, Messrs. S. M. de Freitas, B.A., B.C.L., E. F. Fredericks, LL.B., E. M. Walcott, F.R., H. A. Britton (President), H. A. Thompson, and H. F. Pollard (Vice-Presidents), J. R. W. Straughn, (Treasurer), R. P. Carryl (Minute Secretary), D. D. Haynes and R. McArthur (President and Vice-Presidents, respectively of the Mahaicony Farmers' Association), D. W. Fingal, J.Z. Peters and H. L. Palmer, also Mesdames Walcott and D. Fullerton. The hall was crowded with a large and respresentative gathering, among whom were Mr. and Mrs. Thos. Barlow, Mr. and Mrs. Holder, Dr. R. S. Miller, Messrs. Fullerton, S. E. Gomes, C. A. Dowding, E. M. Morgan, A. Hughes, J. E. Henry, and a bevy of ladies.

Mr. R. P. Carryl, Asst. Secretary of the Conference, next announced the results of the election of officers of the Conference which had taken place that afternoon and which resulted in the re-election of all the officers with the exception of Mr.. Stanley E. Thierens, who was displaced by Mr. R. P. Carryl for the post of Minute Secretary, and the addition of the Rev. W. A. Deane to the Committee of Management.

Introduction of Chairman.

Introducing the Chairman of the evening, Mr. Aaron Britton, President of the Conference said: " Ladies and gentlemen, mine is a very pleasant duty to introduce to you as Chairman of this meeting to-night no less a person than Mr. F. A. Mackey, a son of the soil (applause). Mr. Mackey may in the course of his remarks refer to the fact that he is not a public man, but so far as this Conference is concerned, I think I am safe in saying that no public man has to his credit as great an accomplishment within a period of one year as Mr. Mackey has achieved as the

result of his speech to us last year. Peanuts, black-eye pease, coffee and other products were not considered or cultivated on a commercial basis. Mr. Mackey came to us last year by our invitation, and in the course of a very plain talk with us, not with a spirit of carping criticism, but with a desire to assist us, intimated clearly and with earnestness, channels in which he considered improvements were possible to be made. Conference accepted his criticism, and to-night Mr. Mackey has the pleasure in knowing that away up on the Corentyne nuts have been planted, also on the West Bank and other parts. On the West Bank plenty of black-eye pease have also been planted, and I have been told the fashion nowadays in most homes on the West Bank is to have black-eye pease soup as a meal in the afternoons. I think therefore that Mr. Mackey has done good service. It is not surprising, because Mr. Mackey, as a son of the soil, coming in succession to his father may, perhaps some day attain to his father's eminence in this colony, who not only in the legislature but on the Executive Council has done in a quiet and unobtrusive manner good work. Although not born in this colony, his father was greatly attached to the colony, and after his death his body was brought from accross the seas and entombed in this colony. Mr. Mackey as a creole is very anxious over the welfare of the people, because as he told me on occasions more than once that with the people prospering everything would go well.

We have a very lengthy programme, and therefore I would not trespass on your time, because those of you who have programmes would see we have giant intellects to-night. Conference is exceedingly gratified at the attendance of these gentlemen on the platform who have done so at some personal inconvenience. We are glad you are here, and we are particularly glad that we have Mr. Mackey with us. Mr. Mackey had almost said to me I would never come out again, but after I prevailed on him he came out last year and he did his duty so efficiently that the Committee was insistent that we leave no stone unturned to get him once more. In fact, one man suggested that he should be a permanent fixture so far as

Conference is concerned. It is better to have a friend than to look for one. Mr. Mackey has demonstrated in a practical manner his sympathy with the farmers, and I have great pleasure in asking him to take the Chair and to preside over this meeting.

Mr. Mackey's Speech.

The Chairman, addressing the meeting, said:—"Ladies and gentlemen,—I thank you for the privilege which you have accorded me by asking me to preside at this public meeting this evening, which I see is held under the auspices of the British Guiana Asssociated Districts Agricultural Societies, and for the opportunity that you have given me of saying a few words about the agricultural possibilities of this colony. You may have observed that I use the words agricultural possiblities. I do not use the words agricultural industry, because it is an indisputable fact that apart from the established industries of sugar, rice, etc., we have no orginised agricultural industry at present. It is not pleasant duty for the Press, it is not pleasant for me or any of us, to find fault with the farmers of this colony. It has been said, and I think it has been rightly said, that year in and year out we have conferences and meetings, but so far we have not really shown any material advancement in our attempts at agriculture. One year we are told of disastrous floods, another year we are reminded of the drought, but the Government, as you know, have now given us drainage. I believe irrigation schemes are on foot. You are also getting Artesian wells, and if you do not make any strides in the future it will be interesting to hear what excuses will be offered. I feel sure that there will be no need to offer any excuses because there certainly seems to be a very decided and keener interest taken by the farmers and a determined effort on their part to improve their lot in life not only for their own good but for the good of the colony generally. During the last year there has been a joint conference of the Chamber of Commerce, the Planters' Association and the Farmers' Conference in Georgetown. This conference to, my mind, certainly

seems to show that there is a better feeling of co-operation existing between all classes of the agricultural community including the sympathy and co-operation of the sugar estate proprietors. The report of the meeting, I have no doubt, has been well studied and digested by all of us who take an interest in the agricultural possibilities of this colony. There are, as you have been told on many occasions, great possibilities for this magnificent colony of ours, and perhaps I can do no better than give you certain information which I have read from the report of the Imperial Economic Committee which sat last year to discuss the question of marketing and preparing for market foodstuffs produced overseas. In this report I have read that the development of banana cultivation within the Empire comprised a number of separate and independent problems. The supply to the home market of bananas grown within the Empire is a problem in itself and must be treated as a single undertaking from the point of production to that of retail sale, otherwise the committee tells us any scheme will break down. There must be, and this is most important, as far as this colony is concerned, an adequate supply to guarantee a shipping service and that service must remain independent of any exsisting monopoly. In other words there must be a gaurantee of supply of independent shipping and of a market. The recommendations of the conference held last year, to which I have referred, have been strongly endorsed and borne out by the committee, and special reference has been made in their report to British Guiana.

BANANA CULTIVATION.

Amongst those references I read that the committee are perfectly satisfied that we have ample accessible lands in British Guiana for the cultivation of banana, but the governing factor is the Panama disease, and certain recommendations have been made with regard to the variety which should be cultivated. They strongly endorse the recommendation of our local conference to establish experimental ten-acre plots in various districts in the colony, but this question has been deferred until the arrival of the newly-appointed Director of Science and Agriculture from

Trinidad. What is a very important recommendation in this report, and I feel it is a recommendation that will probably appeal to you, is one from the committee that for such experiments financial assistance might be given up to $2,000 a year. If this recommendation is carried out by the Imperial Government we only hope that it will be well expended in a well-thought-out system of cultivation, and that in two or three years we can say that the money was well spent. I understand that the Combined Court has from time to time voted various sums of money for experimental purposes. I may be wrong, but I think it is in regard to cotton; so far nothing has been done. I speak, however, subject to correction.

THE GRAPE FRUIT.

Another fruit that could well be cultivated here is grape fruit. This fruit is rapidly gaining popularity in the United Kingdom, and if we can produce it of good quality and in appreciable quantities, I am quite certain that it will meet with a very ready market in England. Oranges are also very largely imported into the United Kingdom, and you would be interested to hear that out of 375,980 tons imported into the United Kingdom in 1924, 84.6 per cent. came from foreign countries, and from British ports only 15.4 per cent. Out of this 15.4 per cent. the West Indies contributed the magnificent total of ·8 per cent. There is also a good, market indeed for ground nuts in the United Kingdom especially for pea-nuts, but the buyers on that side would naturally like to see a sample. I have not got the slightest doubt that you will be able to show samples, for this Colony in nuts as well as everything else excels in samples. What we want are samples of what can be produced. With regard to the cultivation of pine-apples, I think this subject can be left in the very capable hands of Mr. Hector Josephs, the Attorney General, who probably knows more about pine-apples than anyone in this part of the world. I have talked quite long enough on the export possibilities, and I am sure that you will agree with me that we should make a start to cultivate fruits which find a very easy market.

Dutch Advice.

You have been told, however, by a gentleman from Dutch Guiana who came over a short while ago that you should not cultivate fruits, that you should confine yourself entirely to ground provisions and vegetable. If I were a Dutchman and not a creole of the Colony, a son of the soil or as otherwise called a "mudhead," I would no doubt give you that same excellent advice myself because there is no doubt that Dutch Guiana finds a very easy sale for her fruits in this Colony. A short while ago I was offered a shipment of 250 crates of oranges for retail, but this offer I declined for various reasons. The first reason is that I promised Mr. Aaron Britton, your president, that such fruits as we require for our own retail convenience I would prefer naturally to purchase from the farmers of British Guiana. There is another reason as well—I, like all of you, and I pointed it out to Mr. Brassington as well, have seen fruits from other countries for sale in various stores in Water Street. To establish an industry—and we have no organised fruit industry—we have to start slowly. We must compare the establishment of an industry with an infant. An infant, we all know has to crawl before it can walk; and it has to walk before it can run; and it has to run before it can jump, therefore when we do make a start in establishing a fruit industry we must go about it very carefully and very slowly. First of all, there must be an organised system controlled by efficient and capable men who have made agriculture their life study.

Trees must be regularly planted from selected seeds supplied by the Department of Science and Agriculture. They must be cultivated and pruned and not as they are at present, simply neglected and left to take care of themselves. The tendency to-day seems to be to pick fruit from the tree before it is ripe. I really do not know what the idea of it is, except perhaps that certain farmers realise that if they did not pick the fruit themselves someone else might take it for them. There must be hard work six days of the week instead of as I think has been done until quite recently, only two or three days and the balance of time you spend either sitting down in your houses or abusing one another. If we are successful in establishing a fruit industry

in this Colony I think it would go a very long way to settle many of our difficulties, for if we have a fruit industry it would encourage settlers to come down here and those who are here already will be contented and happy.

I would just like to refer to the Government agency and depot in Georgetown. This agency, as you see by the papers, will be opened on September 1st, and will receive fruit and vegetable from the farmers of all the districts in the country. Some time ago you asked for an agency and depôt of this sort and now that you have got what you have wanted it is entirely up to you to make it a success or a failure. I am perfectly certain that you will do your best to make it a success (Cheers).

Cattle Rearing.

Mr. Stanley M. de Freitas then addressed the meeting on "Cattle Rearing" as follows:—

Some time ago I received an invitation from your President to say a few words to you on the improvement of the live stock industry of this colony. It gave me two-fold pleasure in accepting the invitation, first, because I was able to anticipate the happiness of addressing so important a gathering of my fellow countrymen for the first time on a subject which I know interests you as much as I know it interests me, and because it transports me in thought back to a part of the world where I spent two very happy years of my life and which held great charms for me. I refer to the Union of South Africa and especially the province of Natal where I was associated with men of your own mentality. My position in addressing you on this subject appears to be ironical. Gentlemen, I am a lawyer and a lawyer is always looking for precedents, and I have been trying to find a precedent where a lawyer has been invited to speak on a subject so foreign to his own profession. Happily I am able to find that precedent on our programme of this evening's entertainment in which I see that the learned Attorney General is going to address you on pine-apples (Applause.) I find myself in another position of irony

and that as the chairman told you in his very admirable address, that you would be far better off if you ate more fruit and less beef, and I am here to speak to you on how to produce more beef. (Applause).

Improving Colony's Live Stock.

The question of improving live stock in this colony has to be looked at from two separate and distinct aspects. One aspect is the improvement of live stock chiefly with a view to beef production and the other with a view to milk production. I propose to-night only to deal with the first aspect and that is improvement with a view to beef production. In order to produce beef and to produce milk, two separate and distinct methods of treatment have to be adopted. The mere fact that one has been in the position of observing the products of one country as compared with similar products in another country magnifies the efficiencies or deficiencies of the one to the detriment of the other. When I arrived in this colony about 22 months ago as I had taken a great interest in the live stock of South Africa, having been closely associated with stock-breeding for about two years in that part of the world, as I drove along the East Coast my interest was aroused in the class of stock one sees roaming about the pastures. I am sorry I have to admit that the animals of any merit whatever are very isolated indeed. In order to produce live stock of any merit to the colony there is one object to be kept in view and that is infusion of new blood. The agricultural department has got a few pure bred bulls. I do not say that they are outstanding animals and altogether suited for the condition of this colony—but I understand that stock-raisers do not avail themselves of the services of these animals because they feel that the service fee of sixty cents is too oppressive.

I am not for or against the Department because I do not know your side of the case but it would appear to me off-hand that when one considered that these animals cost Government something in the vicinity of $400 or $500 to import and maintain, the fee of 60 cents is not prohibitive.

Pure Bred Bull of Class Wanted.

The first thing to be considered is introducing into the colony a pure bred bull of one of the recognised beef breeds. You have a few Government bulls at your disposal already and you must avail yourselves more of their services. You have a good foundation already on which to make a start and that foundation is the native cows of the colony because they are regular breeders and good mothers. If farmers insisted on having nothing but the best bull available for service they would then see the result almost immediately. Your first calves would be half-bred. But the selection of the right kind and type of bull is a matter of great importance. There are several desirable breeds that can thrive well under local conditions —chief of these being the Aberdeen Angus and the Herefords. I am more inclined to the Aberdeen Angus because it is a short-coated animal, it is polled or hornless and of very early maturity all of which are very desirable characteristics for a colony such as this. It is also a Scotch breed of animal and as you know, gentlemen, for generations past, Scotchmen have earned a very enviable reputation for being thrifty, economical and good colonists. Their live stock seem to have acquired similar characteristics. It is absolutely necessary that if these bulls are to be imported from the United States they must not be imported from one of the tick infested districts of that country, otherwise they are sure to get Red Water which is known in the United States as Texas fever. Failure to take this precaution in the past has led to very distressing results. The result aimed at is that instead of producing an animal that matures in six or seven years you would have an animal maturing and producing excellent beef in about three years or less. It is not only the early maturity but the fact that you are producing more palatable beef which you would be able to market at a better advantage. I know there is no real shortage of cattle in the colony, but a shortage of good cattle. If you had animals that would mature in three years, instead of your having to chase after the butchers to sell them, the butchers would be chasing after you to buy them. To give you

an example of the results of introducing pure bred bulls to a native herd, in South Africa an animal that won the Fat Stock Championship two years ago was 22½ months old and weighed 1,850 lbs, and to show you what great interest is being taken in other countries of the world to-day in the production of prime beef you will be interested to hear that the steer which won the International Grand Championship in America last year was bought by Hotel Sherman of Chicago for the record price of $7 per pound. For the improvement of live stock, aim chiefly at early maturity, then a system of grading up is to be followed eventually by selective breeding, and you can only get that by introducing new blood into your native cows and so counteracting the degenerate effects of in-breeding. Every stock-raiser should be competent also to ensure that not only the females of his herd breed regularly, but also that the calves of each year are superior to the calves of the previous year, for your profits depend on the number of calves you get each year and that is largely a matter of management. He must be competent to prevent, and if necessary to cure, the ordinary stock diseases. You are blessed in this colony so far as stock diseases are concerned, in fact you might say you are relatively free from stock diseases. The only diseases with which cattle here are affected to any extent are anthrax and tuberculosis, but if I were to mention only a few of the stock diseases that assail the farmers of the Union of South Africa, for Example, Anthrax, Tuberculosis, Red Water, Gall Sickness, Quarter Evil and Rinder Pest, you will readily see that they almost have the plagues of Egypt to contend with.

PERSEVERANCE AND KEEN OBSERVATION NEEDED.

In order to illustrate to you how individual perseverance coupled with intelligent observation can achieve results which are almost of national importance, it was found that certain very large areas in South Africa though at first glance possessing plenty of natural pasturage, were incapable of maintaining live stock suited for any commercial purpose. The keen farmers in those districts observed that the few cattle that lived there were continually chew-

ing the sun-bleached bones of animals that had perished from time to time on the veldt. This habit was looked into and reported to the Veterinary Department concerned,—which then began to make careful investigations as to the cause for this unnatural craving. A series of elaborate experiments were then conducted by the Government Department concerned, and it was discovered that this unnatural craving among the cattle of old or decaying bones was due to a complete lack of phosphorus in the soil and consequently in the grasses for those districts. It was also discovered that this phosphorus deficiency could be counteracted by a daily ration of two to three ounces of sterilized bone meal. As the result of this discovery that vast extensive but profitless district of the Union became an economical factor in live-stock wealth of the Union. The same to a certain extent applies to conditions here.

Pasturage is a matter of great importance. All the grasses and other vegetations on your estates are very deficient in one of the most essential ingredient in the nourishment of live-stock and that is phosphorus. The soil of British Guiana generally, is very deficient in this substance and I feel that the technical officers in the Department of Agriculture will bear me out on that point. You therefore cannot produce an animal of the type of those produced in Barbados, an island well supplied with lime and phosphorus, unless you counteract this phosphorus deficiency. This substance is a determining factor on the bone formation of animals and tend to enhance their growth and the ultimate size to which they will attain. Animal husbandry cannot be divorced from agriculture, they go together and are essentially enterprises of a co-operative nature. That being so, those desirable results which you should aim at either in animal husbandry or agriculture cannot be achieved without co-operation, and here I feel I must say just a few words on this subject.

Since my return to the colony I blush to have to admit that I have not been able to detect a spirit of co-operation in any sphere of human activity locally. To

the reverse, gentlemen, I have observed that there prevails a general atmosphere of distrust and suspicion as between man and man. Often one man is afraid to let his neighbour know the result of his researches perhaps for fear that his neighbour will eventually become wiser than he. The position, gentlemen, is all the more disturbing as one realises that this unwholesome atmosphere is not confined merely to the little minds of little men, but appears to be animating the spirit of men who occupy positions of considerable prominence and importance in our local life and men who ought to set a more elevating example that is worthy of following by you and me who are ready to learn. Unless you are willing to pull together and exchange your views in a friendly spirit there is very little chance of success. When you have started on the road to progress and have gone half-way you will be in a position not merely to ask for Government's assistance, but to demand it and here, gentlemen, I must ask you a question which I should like you to think about in your spare moments and answer yourselves.

That question is, have you really and seriously started on your part of the journey along the road to progress? And remember the race along that road is not a flat race; it is an obstacle race, but all the obstacles are surmountable, some with a greater degree of effort than others, and with such an intelligent class of agricultural labourer as this colony possesses and with soil sufficiently fertile to produce all the things that go to make a healthy, happy and progressive people, it becomes your duty therefore to wrest from the soil those things. (Cheers).

Attorney General's Speech.

Hon. Hector Josephs addressing the meeting on "The Value of Pine Apple and its Cultivation," said: Mr. President, ladies and gentlemen, my learned friend Mr. de Freitas apologised for being a lawyer, I do not apologise for being a practical agriculturist in spite of the presence of Mr. Walcott, Mr. Brassington, and others I see about me. One of the reasons for it is, I come from an island where life is very hard and we live entirely by

the soil. We have not been blessed with gold, or diamonds, or minerals which may or may not be a blessing. It may be a blessing to individuals but may prevent the development of that co-operative spirit of which Mr. De Freitas has so well spoken. The presence of attractions like those may tend to disintegrate the cohesion of the whole and the individuals may go off at a tangent. I do not say that occurs in this colony but that is the result which is not at all unlikely to ensue. In my island home we have got to till the soil. We grow stuffs for export and we grow articles to feed ourselves. One of the good things the War did for us was to intensify our cultivation and particularly with respect to articles for local food consumption, with the result that our importation of foodstuff considerably decreased. I have never grown a cabbage that weighed less than eight pounds. I tried to, but never did it. I was very disappointed if any of my tomatoes weighed less than a pound. I grew Seville oranges from which we made marmalade; grape fruit, sweet oranges, bananas and a variety of other things. We live largely by bananas in Jamaica. During the first six months of this year we exported 9,000,000 bunches of bananas. I suppose that by the end of the year we shall have quite nearly 20,000,000 bunches exported. All of it does not go to England or the percentage of the Economic Committee's Report (referred to by the Chairman) would be different.

With regard to pine-apples I am glad to see there are some good ones grown here. It is a very interesting branch of agriculture to me. My father took it up as a hobby and devoted a great deal of attention to it and experimented a good deal with it and as a result he got very fine results indeed. There is one difficulty about my addressing you on this subject and it is the difficulty of the soil.

Coast Lands Too Low For Best Results.

Personally I may be wrong but I do not like to think that in these lowlands where you are likely to have heavy rainfall, even with drainage that you can get the best possible results from pine-apple culture. You may do very well

but you will not get the very best results. I think some of the plants I have before me are indications of that, from the form of their growth, the colouring and the roots, but there are parts of this colony which some of you may not know, and I think the sooner you know them the better for your health and the better for the colony's sake, where certain articles which it is difficult to grow down here will thrive and prosper for the material advantage of the people who grow them and also for the benefit of the balance of the people round about Georgetown who would consume of them. I refer to the highlands of the North-West District.

SOIL IN THE NORTH-WEST DISTRICT THE MOST FERTILE.

To my mind the soil of the highlands of the North West District is about the most fertile you can get anywhere in these tropical parts. It is rich soil and well drained and pine-apples will not grow well except in well-drained soil and they will do best if in that soil there is some amount of sand—sandy loam we call it. If, however, you are likely to be deluged with water, your results will not be good and I would never recommend that you should cultivate them as a large business enterprise because it would hardly pay, but given suitable soil I would venture to think that pine-apples will pay if you get the right variety, better than any other article that is cultivated in this colony, not excepting sugar, (applause,) even with the consequential products such as molasses, not to speak of rum.

The pine-apple is very prolific. First of all if you get the right kind of soil you will have to plough thoroughly, digging fairly deep down and turn the soil up well. The soil must be soft and not in big lumps. It must be thoroughly turned up and, as was mentioned a while ago, I think by the Chairman, it is true of pine-apples as of every other form of agriculture, you must plan out your cultivation and plant in straight lines. One reason for it is that you get very many more to the acre and you know exactly how many plants you have put in and you can calculate the results very much better. When you have prepared your soil the best way is to plough up the whole of the land. If you can do that, you can plough in rows of

about twelve inches wide in a straight line and as far as the depth is concerned you want to get down to nine inches at least, so that it involves some amount of hard work but the results you would get would quite amply repay the trouble. When you have done that you should put your plants in, if it is good soil not nearer than two feet square and if your soil is good indeed I should say three feet square. I am speaking by the book. An important consideration is the selection of your plants. As you know, the pine-apple tree bears only once and under the best advantage, when the plant has borne fruit there comes out around the sides of it, suckers. You do not get prolific suckers from old plants. (The speaker here demonstrated how to remove the suckers from the parent plant which he characterised as being very important and the manner in which they should be planted and the time of planting which he pointed out should be just before the rainy season.) It is very important that you keep the cultivation clean. It is essential in all kinds of cultivation that it must be kept clean of weeds. The plants must not be smothered at all and in cleaning them out you must be careful that there is no pushing or moving about of the plants themselves. You keep them clean and the next year you begin to get fruit. You get one fruit from each plant, but that is if you have the right kind of pine-apple. That would go very largely to defray the cost of your cultivation and ought very nearly to cover it. If you are doing an export trade it would probably cover it. The next year you are going to get two or three pine-apples where you stuck one in the year before. If they are healthy plants you are going to get two or three healthy suckers coming up. Some vigorous plants would produce perhaps half a dozen suckers. It does not do in the second year to have more than two or three, and if the plants are not healthy you do not want more than two. Still keep them clean and if the soil appears to be getting hard, soften it with a fork and the next year the number of pine-apples you would get would depend on the number of suckers you allowed to fruit. In good soil that would keep on for four or five years without the plants growing up out of the soil. I come to

The Question of Variety.

There are several varieties, some are ornamental, some are useful. There is one, the best of all which you have in British Guiana, a fruit in Jamaica which we know by the name of Nasbury, which is an adaption of the Botanical name called Sapodilla known here as the Montserrat. That is the most prolific of all, the best flavoured fruit, and also has the best keeping qualities. You can send them on a fourteen or fifteen days' voyage to England; if they are put up in crates, carefully handled, none of them would be spoiled. I am speaking of sending them not on these modern ships with refrigerators but on the ordinary steamers like the Royal Mail which used to travel between the West Indies and England. My view is that if you are going to undertake an industry of any kind, it does not involve any extra expenditure or labour if you deal with the best variety of the particular plant you are going to cultivate. It is the cheapest in the long run, you get better flavour, more prolific plants and good keeping qualities. If you are selling them in the local market it does not matter very much. In the old days in Jamaica they used to be sent to New York and London and Glasgow in flour barrels which were ventilated by having each alternate stave cut away about half and the heading on each side opened. They could pack a barrel with 30 to 40 good fruit and pack them tight, and they use to arrive in perfect condition. Now-a-days they ship them in crates. I am not a believer in crates, for the reason the pine-apple is a very delicate fruit and requires delicate handling, and when you are dealing with a barrel it is easily handled and easily rolled, whereas the crate is an awkward thing and if pushed about it comes down voilently on the ground and the fruit gets bruised, however tightly you pack them. It would be advantageous to find out some better means than crates to ship your fruit. They kept without any refrigeration machine for two and a half weeks on a voyage to England in pre-war days. I have known these pine-apples, I am speaking of those cultivated under the best conditions, being shipped abroad to England and the United States giving a net return of £100 per acre and that is why I say it is a mode

or form of agricultural industry that probably will pay or or ought to pay better than anything else, but it requires the *greatest possible care. Every part of the process* requires the greatest possible care. There can be no scamping of the preparation of the soil or of the landing of the plants or of keeping them clean. I do not know what price they will fetch to-day. I think they would do better here. Again there is the question of

Co-Operation Among Small Proprietors.

It may be that the man who can grow half an acre or an acre cannot afford to ship them. He has not got agents abroad to whom he can consign them, but I venture to think that if the industry is seriously undertaken in this colony and if merchants here find that the fruit is being grown on a large scale and that there were people cultivating the pineapple properly and producing them as they ought to be produced they would pay good prices for them. If the merchants get fine fruit they would ship them and everybody would benefit as the result. I would suggest that some endeavour might be made in that respect. You are having a Farmers' Conference. A conference does not mean speeches and "talkee-talkee" which ends in forgetfulness when we depart for our homes. It means that we meet together to discuss problems, to find a way of handling the subject, the best way of dealing with a particular thing. We confer together and as the result of the conference we arrive at a conclusion with regard to a particular industry that the best way of handling it is to do a certain thing in a certain way. After we have discussed and arrived at that conclusion then it behoves us to go away and put that into practice. If you were to put into practice what has been told you by the Chairman and what has been so well put to you by my learned friend, who would no longer apologise for being a lawyer, I am sure you would go a long way towards being better off and in the doing of it we would depend largely upon ourselves.

I should like to say and I should say it has struck me that in this colony there is just a little too much dependence on what Government ought to do and what Government

should do. I cannot help it. I think it is so. I will tell you why. Because I have come from a country whose prosperity, whose very dependence is on agriculture and the Government played no part in the introduction and development of any of our big agricultural industries. (Applause.) They never did it with banana which is one of our big industries, they have not done it with coffee—the Blue Mountain coffee commands the highest price in the world. It might be of interest to my learned friend to know that with the cattle industry we proceeded in Jamaica very much on those lines wanted by him. We have a number of Heresfords, Jersey, Angus and other cattle imported into the Island but not by the Government or the Agricultural Department. Horse-breeding is one of our great industries, and I think that the department of Arigculture there, so far as I remember, had three thoroughbred horses and private individuals must have within the last ten years imported a few hundreds. Might I suggest that if we begin to strive for ourselves we can do a great deal, and as I said a while ago, we can then say this is not a question of experimenting to see if we can rise to the occasion, but we have shown what we are capable of doing and we now ask Government to give us a helping hand. I may say you can then claim it as a right.

I need not mention how glad I am to be here this evening to address you. I hope there may be some attempt to grow pine-apples and if I can do anything from a practical standpoint in the way of instruction I would be glad to do it whenever possible." (Appplause).

Hon. F. Dias next addressed the meeting on the possibilities of the West India Conference and pointed out that agriculture would form one of the subjects to be considered by the Conference in future and that the appointment of Mr. Nowell as Director of Science and Agriculture of the Colony was influenced by the desire to have a skilled agriculturist at the head of that department.

Hon. R. E. Brassington addressing the meeting on "Cane-farming" stated that as much money could be made from the growing of the sugar-cane as from growing the pine-apple. In growing the sugar-cane the three necessities were

(1) hard and steady work; (2) intensive cultivation and (3) co-operation between employer and employee. He had always been a firm believer in the future of the sugar industry of the Colony, and also that the day would come when the sugar-grower would be able to offer bigger prices to the cane-farmer and would be able in other ways to make cane-farming attractive. He was not only interested in cane-farming but in the cultivation of coconuts and of rice as well. They should ask themselves why they do not produce more rice, sugar and coconuts. Take Hawaii with a population of only 10,000 more people than this colony, they produce 600,000 tons of sugar which is six times more than is produced in this colony, and 1,600.000 pine-apples besides exporting rubber and banana and sisal hemp. It might be asked how they achieved that, the answer is, by steady and continuous labour, by a magnificent system of irrigation and by the most up-to-date implements and machinery both in field and factory. They, in the sugar business were trying under great difficulties, because at the present moment the cost of producing one ton of sugar was greater than the selling price. They were trying to put their house in order, to instal up-to-date machinery in the factory which meant more money for the grower. With drainage and irrigation, steady market and improved machinery one might well consider that there is something to be made in cane farming. He was very pleased to be there that evening and to address them. If his life be spared to visit that part of the colony again he hoped to hear a very encouraging report, not only with regard to the rice industry which was raised up by the indomitable spirit and patience of the East Indians in the face of great difficulties, but to farming generally. It was hard work and reliance on themselves which was the road to success. (Applause).

Mr. Walcott was also asked to address the meeting but declined on account of the lateness of the night, remarking that he would have an opportunity to do so at a later date.

Mr. Fredericks was next requested to address the meeting and gave a humorous summing up on the points raised by the various speakers who had preceded him.

A vote of thanks by Mr. Z. Peters and seconded by Mr. O. McGarrell was unanimously accorded the chairman, and the speakers, after which the meeting terminated with the singing of the National Anthem.

RUBBER COAGULANTS.

We learn from a trustworthy source that the Department of Agriculture, Straits Settlements and Federated Malay States, has recently had under consideration the question of the use of alum as rubber coagulant. A few years ago, owing to reports from United States manufacturers on the quality and especially the low rate of vulcanisation of rubbers coagulated by the addition of alum to the latex, a heavy import duty was placed on alum imported into the Federated Malay States, where up to that date it had been largely used by Asiatic smallholders. A questionnaire has now been sent by the ***Agricultural Chemists*** to a large number of British, European and American rubber manufacturers with a view to ascertaining whether the prohibitive duty on alum should be maintained. Replies received indicate that the reintroduction of alum as a coagulant would almost certainly tend to greater variability in respect of rate of vulcanisation, and they point out that such variability is still of considerable importance in spite of the more extended use of powerful organic vulcanisation accelerators which do not entirely eliminate original variability of the raw rubber. Investigations into the value of formic acid as a coagulant indicates that it is a good and cheap substitute for acetic acid and has no harmful effect on the rubber. The amount required for coagulation is only approximately half that required in the case of acetic acid, so that even at an equivalent price its use should prove an economy,

METEOROLOGY AND AGRICULTURE

W. R. BLACK, B.Sc.,

Ministry of Agriculture and Fisheries.

CLIMATE, definable as the average of meteorological conditions over a long term of years, has a predominant influence upon agricultural production. As crops differ in their individual demands for warmth, rainfall, and sunshine, so an excess or deficiency in the requisite quantities of these essentials causes injury and possibly complete failure. Not less important than the requisite seasonal quantities of these meteorological elements is their incidence in the life of crops, since as a general rule there are critical periods or stages in growth at which certain quantities of rain, sunshine or warmth are particularly necessary. Climatic conditions are often found in "zones," the effect upon vegetation being most clearly exemplified in continental regions, such as North America, with its cotton, maize, and wheat belts. In England, as a result of the climatic differences, corn crops are found mainly in the eastern and grassland in the western counties.

In addition to their direct action upon crops, meteorological elements have an indirect influence, bearing chiefly upon cultural operations and upon the pests and diseases to which crops are subject. Obviously, if ploughing, seeding, and harvesting operations have to be undertaken when weather conditions are adverse, the chances of a successful crop are lessened. Temperature and humidity at various periods in the life history of insect and fungus pests are all-important to the development of these pests, the effect being accentuated if at the same time the weather conditions adversely affect the growth of the host crops or bring them to a susceptible state at the right moment from the point of view of attack. The weather, also, indirectly influences crop growth through its effect on the soil, rainfall above a certain amount leading to the washing away of plant nutrients,

breeder, for example, desires to know the critical stages in a plant's growth so that he may breed varieties with characteristics that will render them more resistant at those critical periods (whether to direct adverse weather conditions or insect and pest attacks), or characteristics that will predispose those critical periods to occur at times when weather conditions are likely to be favourable. An outstanding example of fitting a crop to climatic conditions is afforded by the breeding of "Marquis" wheat in Canada ; this wheat matures a few days earlier than standard varieties grown up to the time of its introduction ; these days were critical days, however, and the wheat could be grown in districts with a risk of earlier winters, so that a great expansion of the area under the crop in that country resulted. For the same reason "Marquis" escapes much of the rust which used to ravage "Red Fife" and its other predecessors.

The ***worker on soils and manures*** desires to know how, with any given soil, the effect of manures both on yield and quality of crop varies with meteorological conditions, so that he may give advice to the practical farmer in accordance with the weather experienced and that to be expected from a study of foregoing seasons. Thus from a study of soil and weather, the soil worker may be able to advise that a dressing of nitrogenous manure applied for wheat in winter will need to be repeated in spring ; that with the prospect of a large spring rainfall, muriate of potash can be equally well applied to potatoes as sulphate of potash ; that, as the summer is wet, basic slag may be applied with every prospect of increased keep from pastures in the autumn.

The ***soil physicist*** desires to know the effect of meteorological factors on those soil conditions (*e.g.*, soil moisture, plasticity, cohesion, etc.) on which soil tilth depends, so that he may assess the relative efficiency of different cultural operations, both from the practical and economic aspects. He also needs this information to supplement and check his laboratory investigations on the physical properties of soils.

Apart from its intrinsic value to soil science, this knowledge is of the greatest importance to the ***agricultural***

To a limited extent it is possible to modify climatic influences locally, *e.g.*, by draining marsh land ; by cutting down forests ; by irrigation to counteract deficiency in rainfall ; and by the use of smoke screens, artificial heat or flooding to guard against frost. Certain crops, also, such as glasshouse crops, can be grown profitably under artificial conditions that make them almost independent of climate. In general, however, it is true to say that there is no possibility of so changing climate as to render it more suitable to particular crops. Such crops and their varieties must be chosen, and farming operations so ordered, therefore, as best to support the existing climatic conditions.

USE OF METEOROLOGICAL OBSERVATIONS IN PRACTICAL AGRICULTURE.—The crops and operations customary in any given district have been adopted, presumably, after long experience based on past successes and failures. It is impossible, however, to be certain that such crops and operations are indisputably the best, because one cannot be sure that all alternatives have been tried, a consideration which gains in importance when it is remembered that modern agricultural science is ever placing fresh discoveries before the farming public. The practical man should know within a reasonably short time what farming practice can be adopted, what new crops can be grown, and which of the discoveries made by research institutes can be put into operation in his own particular case with chances of success. As a recent example may be cited the introduction of the sugar beet crop, in the case of which the weather conditions which favour good yield and quality must be known and compared with those obtaining in a district in which its introduction is contemplated.

Careful and detailed data relating to meteorological conditions experienced throughout the life of crops, and their effect on growth, are thus required if new agricultural practices and the results of agricultural research are to be given their full value.

USE OF METEOROLOGICAL OBSERVATIONS IN AGRICULTURAL RESEARCH.—A study of meteorological conditions is necessary for the carrying out of research. The *plant*

engineer, as it enables him to base his implement designs on definite information in place of empirical observations. Detailed local data regarding rainfall, humidity, temperature, sunshine, and wind are directly of value to the agricultural engineer in investigations of the use in agriculture of water and wind power and of drying apparatus.

The ***plant pathologist*** is concerned with the effect of climatic conditions on insect and fungus pests in order that control measures may be devised, and, as a result, and with observations of meteorological conditions at any place and time, practical growers may be advised as to the necessity, or otherwise, of adopting these measures. The value of observations on the effect of weather on outbreaks of epidemic diseases of plants is shown by work in Europe and America. In France and Italy it has been found possible, by careful meteorological crop and pest observations, successfully to forecast outbreaks, and an organisation has been set up both at Montpellier and at Turin for the purpose of warning growers when to spray.

Considerations such as the foregoing show how necessary it is for the advancement, both of the practice and science of agriculture, that careful and detailed meteorological observations should be carried out concurrently with observations on the growth, yield, and quality of crops, their response to manures, their resistance to attacks of insect and fungus pests, etc.

Use of Meteorological Observations in Forecasting Yields.—Observations of meteorological data, on the one hand, and of crop data on the other, may prove to be of value, among other purposes, for that of forecasting yields of crops. Statistical methods have been evolved whereby, given sufficient data of both kinds, the two can be correlated and the effect of meteorological elements, singly or in combination, on the crop yields ascertained. It may therefore be possible in future, by using the meteorological data collected in any season and applying "correlation coefficients," worked out by statisticians, to estimate the probability that the crop yield will be above or below a certain amount. This aspect of agricultural meteorological

work is the one above all others that has made a special appeal abroad. The value of forecasts is likely to be increased proportionately to the length of time that they can be made in advance; the date at which they can be made depends, of course, largely on the times of critical periods in the crop's life. One aspect of crop weather forecasting, which has received some attention in the past, is that of weather cycles or periodical repetition of weather conditions; such cycles are stated to have been discovered, and the search for fresh ones is being pursued. Other things being equal, repetition of meteorological conditions may be expected to lead to reproduction of agricultural phenomena.

PHENOLOGICAL OBSERVATIONS.*—In addition to the observations on plant growth and plant pest appearance, required under the agricultural and horticultural parts of the scheme. various stations have responded to an invitation to collect additional phenological observation: these observations are the date of flowering (or other growth stage) of any or all of 21 wild plants, shrubs, and trees. The observations are made year after year on the same bush, plant, or association of plants, growing under average conditions (*i.e.*, not very sheltered or very exposed), well established. In selecting the plants to be observed, preference is given to species growing in the neighbourhood of stations where observation under the Agricultural Meteorological Scheme are being recorded, and which are familiar to farmers and, possible, to other individuals.

It may be explained that the effect of all the meteorological elements making up the character of the season can be expected to be summed up in such plants as have been selected: these plants may be termed indicator plants, and they show whether the season is early, normal, or late. Observations of this kind have been summed up in the United States in a "bio-climatic law" of latitude, longitude, and altitude, to the effect that the climatic variation in plant development is some four days to each degree of latitude

* Phenology is that branch of meteorology which treats of climatic influences on certain recurrent phenomena of animal and vegetable life.

and to each five degrees of longitude, and to each 400 feet of altitude, the phenological dates being later northward, eastward and upward in the spring and early summer, and the reverse in the late summer and autumn. Good use has been made of these phenological observations in regulating farming operations and in combating pests (*e.g.*, Hessian fly).

In addition to the data specified above, diaries are kept at the stations for the purpose of recording day by day the observer's own impressions of the effect of weather on crops. When the material (meteorological and biological), collected under the Agricultural Meteorological Scheme, is available in satisfactory form for a sufficient length of time, arrangements will be made for it to be subjected to rigorous statistical examination with the object of determining the effect of meteorological conditions on the growth of crops. It is hoped, also, to place freely at the disposal of investigators interested in one or more of the various aspects of the work, all the material available. During the time that the scheme has been in operation, monthly reports have been issued summarising the data collected at the various stations, and copies of these reports may be obtained free on request from the Ministry of Agriculture and Fisheries. It is further hoped that the observers at the different stations will keep in mind the objects for which the observations are made, and utilise them whenever opportunity occurs in their own districts. Exceptional occurrences, like long droughts, heavy floods, unusual lack of sunshine, etc., must express themselves on crops and stock, and may produce effects after long intervals that an ordinary monthly comparison will not disclose. There is also the question of the recovery of crops from adverse conditions, which cannot very well be scheduled but may be of real importance and interest to those who are in daily touch with the facts.

The agricultural meteorological scheme of the Ministry is in the charge of a committee, of which representative meteorologists and agricultural, biological and statistical workers are members.

Effect of Weather on Animals.—The writer has failed to discover that much attention has yet been paid, in foreign agricultural meteorological schemes, to correlating the meteorological data available with data relating to animal husbandry. Climate has obviously been as important in determining the fauna of various districts as it has the flora. Obviously, crops have an important influence on the animals feeding on them, so that climate will affect animals indirectly through crops. It must, also, have a direct influence. Temperature and humidity, necessarily, have considerable effect on the ***health*** of animals and on the pests to which they are subject. Temperature must affect the ***rationing*** of animals for the production of meat and milk, and weather conceivably affects the composition of milk; the effect of sunlight, even, has to be considered in connection with the feeding of animals. And, as regards ***breeding*** questions, it seems that meteorological conditions influence fertility (at least of sheep;) and artificial lighting (quite apart from effects on health and rationing) may also influence fecundity. The effect of meteorological conditions on the animal husbandry of the country appears therefore to offer a wide field for study.—***Abstracted from the Journal of the Ministry of Agriculture, Vol. XXXIII., No. 4.***

BOTANICAL NOTES.

By Edgar Beckett, F.L.S.

Some Fibre Plants.

It is a well-known fact that most of the species of the genus *Urena* yield fibre of importance. *Urena lobata* is a common shrub in this Colony and it is found in the three counties. It was possibly introduced here from India. It yields a strong fibre and one which probably might be utilised in the manufacture of rice bags or even sugar bags.

It is interesting to read that "slips of sized paper weighing 39 grs., made from this fibre, sustained 75 lbs. as against Bank of England note pulp 47 lbs. ; it was said to bear ink well, but to work "woody "and hairy" Spons.

An experiment in connection with this plant on a considerable scale is now being carried out in the colony, by a firm interested in fibres.

Crotolaria juncea, Sunn Hemp, grows rapidly and well in this Colony and may be seen in some gardens in the city. Of course, it is one of the commonest of plants in India.

It is stated that in the Punjaub, there are 50,000 acres under this fibre-producing plant. It yields an excellent fibre which is exported from India as 'hemp. The cordage made from the fibre is exceedingly strong. According to Spons, experiments shewed that its breaking strain was 407 lbs.

When one remembers the enormous quantities of rice bags that are imported into British Guiana, not to mention sugar bags, it would seem as if it would be worth while for some one to turn his thoughts towards the possibility of utilising some of the plants which are either indigenous, or naturalised, and which produce fibre suitable for conversion into gunny sacks.

Certain of our species of Hibiscus yield quite good fibre; whilst the fibre from the wild Ochro, ***Malachra capitata*** is, when properly cleaned, most attractive, and is from 8-9 feet in length. This fibre might rival that of Jute.

Sesbania aegyptiaca is a common weed with us—this also yields a good strong fibre, in fact it is said to yield a fibre superior to Jute(***Corchorus***). We might also find that Tibisiri—the fibre made by our aboriginal Indians from our native palm ***Mauritia flexuosa***—might furnish more than hammocks.

Our common MonkeyApple (***Anona palustris***) is said to yield a fibre of value, whilst our various ***Ananassas*** or ***Bromelias***, it is well-known, furnish fibres which are not to be despised.

The whole question concerning the possibilities of our vegetable fibre producing plants is one which will well repay close attention and experiment.

PAPAIN.

Carica papaya grows throughout this colony so readily, that one might apply the term wild, to it growth. We have, on occasion, tapped the fruit of the papaw and dried the latex — a good price was obtained for the product, Papain.

It is important that the fruit be tapped with some instrument, other than one made of steel, and that the latex is caught in a clean porcelain vessel and dried in the sun. It is well-known that its proteolytic virtues aid largely in digestion.

We refer to the possibility of our farmers building up an industry in Papain, as we understand that at present there is a shortage in the supply of this ferment. The writer will be very pleased, at anytime, to show farmers how the product should be prepared.

FIRE WOOD.

For these persons who own land, within easy reach of Georgetown, we believe that quite a respectable income could be made by planting areas of ***Casuarinas***.

Casuarina equisetifolia grows readily in this Colony, even in fairly heavy clays. The calorific value of the wood is extremly high, and we believe, quite an extensive business in supplying cheap and excellent fuel to Georgetown, could be carried on.

The trees can be planted quite closely, 6′ x 6′ would give 1,210 trees to the acre, so that an area of 10 acres would mean a total of 12,100 trees.

At the end of four to five years, every other tree might be cut out and sold, two years later a further 200 trees per acre can be removed, and at the 8th or 9th year, the whole area cleared.

A decent income might readily be realised from this.

With the large areas in this colony not beneficially occupied, a respectable acreage might easily be planted out.

The Sugar Estates authorities also might find it an advantage to cultivate this valuable fuel tree.

In Madras there is considerable activity in the growing of casuarinas—so much so that, a line of railway has been established to transport this wood. The erect habit of the tree, its hardy nature, and the ease with which it is cut, added to its high calorific value, make it an ideal tree for furnishing fuel.

An export trade might be developed, in time, with Barbados, and those Islands, where fuel is scarce.

THE ROOT GROWTH OF PLANTS.

Lecture delivered by Major Caws at the Half-Yearly General Meeting of the Associated Branch Societies of St. Thomas.

It was certainly very flattering to an amateur such as myself to receive Mr. Buckley's invitation to read a short paper to a meeting of experts in agriculture, and I only consented as I felt I should like to submit for your consideration the result of some slight investigations of mine in what is certainly a very important branch of study.

Perhaps what I have to say may better be described as "Suggested Improvements in cultivation to secure better conditions for the root growth of plants." I do not know if your experience is mine, but from many conversations I have had in different parts of this island with those who get their living by tilling the soil, I have formed the opinion that the underground growth of the plant is a subject that has received little attention. I have, for instance, asked perhaps one hundred Jamaican peasants how far they think an Irish potato will send its roots, in suitable, deeply cultivated ground, and I have received all sorts of answers, from four to ten inches, the general answer being "about seven."

In an article by Luther Burbank, the "plant wizard" of America, which I read recently, he speaks about a potato under certain conditions sending its roots 30 feet. And I well remember reading of some experiments in France in 1897 in which a French scientist cultivated ground to a depth of two metres, or nearly seven feet, and traced Irish potato roots to over one metre, or say 3 ft. 6 ins. below the surface.

There is also the carrot. I have made the same enquiry of the same sort of people and I never yet got anyone to tell me that the carrot runs down more than fourteen inches. But in 1921 I measured six carrots, in a bunch, which took the first prize at an Agricultural Show in England and they averaged 27 inches. The roots had

broken off at about an eighth of an inch thick, so that remembering that those same roots run down till they are of the thickness of a piece of cotton thread, it is probable that the extremities reached to five or six feet below the surface. If that is thought an exaggeration I would like to tell you of an instance recorded by Mr. Mechi, a well known English farmer of eighty years ago. Some men were breaking down brick earth in a field that had the previous Spring been sown to parsnips, which have just the same root growth as the carrot. The methods of doing this ensures a vertical face of earth of anything up to 15 or 20 ft. according to the depth of the underlying gravel. The man noticed, after a fall, that a parsnip which had been mixed by those who had dug the crop, was left half in the vertical face of earth and half out, and one of them was intelligent enough to call Mr. Mechi who records that he traced the root to a depth of 13 feet and 6 inches, and that it broke off. The turnip follows the same rule and I saw an instance, quoted in an English newspaper a few years ago, where turnip roots had been traced 5 feet down.

Onions have been traced for four feet. In 1912-13 some large underground tanks were put in at one of the outlying forts in Kingston harbour, where the formation is the well known honeycomb limestone with deep pockets of soil. I saw several roots of large trees (most of them the Jamaica birch) down at 16 feet from the surface, and I am not sure that we ever saw the end of the deepest.

So much for the depth to which roots will go, but what of their lateral spread ? Most of you must have noticed in the Journal for April a very interesting "Seasonable Hint" which spoke of the small jungles we see everywhere in Jamaica with coffee trees three or four feet apart and six or eight feet high, the boughs being interlaced, and the crop a dozen or two dozen berries and sometimes not that. What of the roots ? Well, having read that item, on 13th May to be exact, I went to a coffee tree near my house, which stands about ten feet from the nearest tree. I dug down at 4 ft. 6 ins. from the trunk (which I may say is about 2 inches in diameter) and cut

through a tangle of roots. So I extended the hole away from the tree, and worked out the ground on each side of it, finally finding the end of the longest root at that point at 5 ft. 9 ins. from the tree, and the average of five or six roots proved to be 5 ft. 7 ins. What chance therefore have the trees in the jungles referred to ? Their roots must be much more badly interlaced than the branches overhead, each robbing from the other and literally choking the life out of the neighbours. And, as to three or four feet apart I may observe that that is a very liberal estimate in many instances; and I know several places where the distance is much less, perhaps the worst being about two miles from Trinity Ville where four trees are growing on less than four square feet.

The London Police consider a packed crowd to be one which carries eight people on the square yard. There appears to be no reason why any coffee tree in Jamaica should emulate a packed crowd in London; but this is what those trees are forced to do: and again I ask : What chance have they, when they cannot send their roots six inches without meeting those of another tree ?

Another intance of lateral spread is the yam root. Last season I had a competition with my headman. We picked out two white yam heads, as nearly as possible the same size, and I gave him the first choice. He knew more about it than I, for the one he picked out had two good eyes, end mine had none, so that his got a clear fortnight's start of mine, and had its vine several feet up the stick before mine was out of the ground. He dug an ordinary hole and made the customary small oval hill, while I dug a hole about 3 feet in diameter and about 2 ft. 6 ins. deep. I am ashamed to say that up to July 1925, I did not know the root system of the yam plant and that all its important feeding roots are laterals. Had I known this I should not have carried out the experiment where I did as the ground we planted in had been dug twice in the previous eighteen months, and I only dug my hole six feet from the other. I treated the hole better than the surrounding ground, filling it up with the surface earth, mixed with a well rotted manure and old broken-up brick

and powdered lime mortar. In addition I put a mulching of manure and grass over the surface for about three feet each way from my plant. At the end of July, about nine weeks after planting I had occasion to pull out a plant growing at the edge of the hole in which I had put my yam, and found to my surprise a root, which evidently did not belong to mine. I traced it both ways and found that it came from the headman's plant, that it was over 8 feet long and hadn't yet done growing. To complete the story of this experiment I found that the headman's yam took full advantage of the better soil in which mine was planted and had a network of roots interlaced with mine, which no doubt set mine back to the profit of his. So I only beat him by about 14 per cent., his yam weighing 31½ when dug, while mine weighed 37 lbs. If, however, he had been 20 or 30 feet away, planted in a hill surrounded by hard soil, without the benefit of the better ground which surrounded my plant, who can doubt that I should have beaten him by 25 or 30 per cent. We are having another competition this year, six roots each. Mine are eight feet apart, with the ground forked between them, and his are the ordinary four feet, but the two lots are sixty feet from each other, so that anyhow he will not rob from me this time.

I think we shall be agreed that the facts I have stated indicate the necessity of deep digging and wide planting. Of course I do not suggest that we should try to cultivate to the depth of Mr. Mechi's parsnip, but certainly if we are to get better carrots and turnips than the little things I see being brought into the towns from the country parts we shall have to loosen and ærate the ground to a much greater depth than is now being done.

And that brings me to the question of the necessity of getting the air into the soil and sub-soil. Fortunately, I am able to tell you of some experiments carried out near the town of Dorking in the County of Surrey, in England, by Sir Arthur Collins, an old retired Indian General. Sir Arthur had in his young days come into contact with the Lord Tweedmouth of his day and had learned from him certain facts as to root growth. He had never forgotten

his lessons, and he always took a very keen interest in agricultural matters. He observed that while a farmer was content to plough his arable lands to a depth of five or six inches he was wiser when it came to his vegetable garden. In that small patch he would double spit the ground to a depth of perhaps eighteen or twenty inches, and would get much better results than those of the open field. So the old gentleman determined to test the matter out for himself and to keep accurate records, and this he did over a period of ten or twelve years. He certainly got some most extraordinary results, and by pulverising the soil to a depth of two or three feet he grew phenomenal crops. His crop of wheat was seven times the average of all England—an increase of 600 per cent. In Irish potatoes he planted sets,—two to three ounces in weight, one to a square yard—that is three feet apart in the row, and the rows at three feet intervals. He got 14 lbs. of marketable potatoes per plant, which at the rate of 1d. per lb. is £280 sterling per acre. (I myself following this method got tremendous plants, covering in the whole area, although planted three feet each way, but my crop was only 8 lbs. per root. Still that at 1d. per lb. would give £160 per acre.) Perhaps the most interesting to us of all Sir Arthur Collins' experiments was one in which he grew fodder grass in 1893. I well remember that year, for at the station in England where I was then serving, I kept certain records, and from a date in February (I think 22nd onwards) I recored over 100 days of bright sunshine. Sir Arthur says that by 1st June there was not a blade of green grass in any of the fields around about him, the hay season being the worst for a century. Yet on that day he cut his crop five feet high, giving him 4½ tons of hay to the acre and he got two subsequent cuttings which gave him three tons more. That stand of grass was cut for seven consecutive years, as against two years which is the common experience.

Sir Arthur proved that deeply-tilled soil is always damp at six inches below the surface, even in the worst drought known in England, and that when the ground is loosened to let the air down freely the roots will follow

and will get down beyond all chance of being dried up. Another great improvement noticed was in.the nitrification of the soil. He points out that tropical soils are often very rich in nitrogen—sometimes as much as one per cent. being present but that is not in a form easily available to plant life. Aeration assists greatly in making this available.

When Sir Arthur began his experiments he always manured the ground but at the end he came to the conclusion that the all-important thing is to get air down well under the surface; and that deep digging without any manure at all, produces better permanent results than shallow digging with manure. We know now why this is, and that the little organisms which fix the nitrogen in the soil, must have the air brought to them, or they cannot do their work. He also found that such sort of soil needed different treatment. In the case of heavy clays it would be fatal to dig eighteen inches and plant straight away in the sour ground. So he put a guard on the fork, and increased the depth of digging an inch ot two every year, thus only bringing up a small extra quantity in 12 months, to be ærated and sweetened by the fresh air and sunlight. It therefore seems clear that root growth is immensely helped by a proper preparation of the grovnd. If the earth be loosened up and sweetened by letting in the fresh air a root will most certainly have less trouble in penetrating the soil, and less strain will be brought on the plant, although more nutriment will be conveyed to it—advantage being thus secured both ways. And this brings me to the reason, which, I think lies behind the sweet potato hills, which I see everywhere in Jamaica. I have never seen either hills or ridges in Bermuda, where they grow very fine crops of sweet potatoes, and I understand the hill is unknown in Cuba. I do not doubt that the dug and loosened-up soil enables the root to run easily and that it was the observation of that fact which led to the making of the hill. But from my own observation the roots of the plant run far beyond the hill, and as the space between the hills is left as a sort of wall of solid ground that has been beaten by the tropical drains, an

baked by the tropical sun into a species of concrete, which the roots have to force their way through, it seems, certain that a strain is brought upon the plant that must retard its growth. I mean to test the thing out by definite experiment. and to plant two measured plots of ground, side by side, each about a square chain. I will communicate the results of that experiment to the Society's Journal all being well, next year. I can, of course, see a sort of reason for the hill in swampy or waterlogged soil; but on a hillside, where there is natural drainage, or in sandy soil, it seems to me that trouble is being asked for when the hill is being made especially in dry season; for just as the area of a basin is greater than the area of the circle which is bounded by its rim, so in the case of a hill is the area from which moisture may be evaporated greater than the area of the flat ground under the hill.

I will close my remarks by describing a method I am adopting this year in the planting of yam. Of course, in departing from old established practice (at least in St. Thomas) I may be making a mistake but after the experiment I have already described, I propose to follow the course which the habit of the yam plant seems to indicate in the case of the Negro, White and St. Vincent varieties. There are some sorts which seem to object to having life made easy for them, such as the Renta and Barbados yams together with the Yampie. These seem to follow the men of the rugged North and to do better when they meet with opposition. But in the others I have mentioned, I notice that if the hole be dug shallow, it is easy to see from the yam tuber where the soft ground ended and the hard began. At that point there is a restriction, a sort of toe is formed, which differs from the rest in shape, colour and density. For these sorts I think a hole should be dug deeper than the tuber is expected to reach to, so that it may not meet with any check in its developments, and I am therefore digging my holes three feet deep. And then as to the lateral surface roots on which the plant depends for its food I am digging the holes three feet diameter, and putting them at eight feet centres, so that they may be a clean four feet before any other roots are reached. Eight

feet has been selected because ultimately the area will be in coffee, and that spacing has been shown to be best for coffee at this level. Next October a coffee sucker will be planted next the yam now being put in, and next year a yam will be put in the intermediate space between the young coffee, In addition to the wide holes I am forking the whole ground between, so that the yam laterals may run freely. This forking, I find, ought to be done within ten days of planting, as otherwise the roots from the new plant may be broken off. The men who are doing the work say that they could never afford to plant in this manner, but the total cost is only 4d. per hole, or say 3d. to 3½d. more than the old system. If I get only 3 lbs. of yam per hill more than the old way I shall get back the cost as well as having my ground deeply tilled. I propose to mulch the ground heavily (all but a circle of eighteen inches across at the plant) and in September and October to plant by means of a pointed stick through the mulch red peas at twelve to fourteen inches apart, cutting off the plant at the time of reaping and leaving the roots to rot in the grounds, thus providing a vertical tube for additional aeration and percolation of water. Only time can tell whether the experiment is or is not on sound lines.

I hope that this short paper may give some of us a little food for thought which is a thing badly needed in Jamaica. What we want more of, is thinking by you men of practise, and the better and more accurate recording of ascertained facts.—*Journal of the Jamaica Agricultural Society, Vol. XXX., No. 7.*

MINERALS IN LIVE STOCK FEEDING.

By Geo. B. Rothwell,

Dominion Animal Husbandman.

Much has been written concerning the subject. Many advertisements appear descriptive of the virtues of commercial mineral mixtures. In a general way, it is difficult to prescribe mineral supplements for live stock. Almost as well try to prescribe plant food in the way of fertilizers without knowing the nature of the particular soil to be fed, and in particular the chemical analysis (as disclosing the deficiencies) of same.

The kind of stock, the age, the kind and quantities of food fed, the nature and analysis of the soil growing all or a part of this feed, whether or not abnormal characteristics (deficiency diseases) appear regularly in the animals so fed—these are some of the factors concerning which knowledge is necessary before authentic information may be given. In this connection, deficiency in, say, the lime content of a soil is popularly supposed to result in a similar deficiency in the lime content of the plant, further reflected upon the condition of the animal consuming the plant. To a very limited extent this is true. The point is that while there is relatively little variation in the lime content of fodders, irrespective of the soil mineral content, and that the crop will lack in yield rather than constituent—the crop grown on a deficient soil tends towards the low range in the lacking soil constituent, and continuous feeding of such a fodder may ultimately reflect this deficiency on live stock consuming it.

Roughly speaking, the animal body contains the same ash materials as are found in plants, and, as a general rule, the elements essential to the life of plants are essential to the life of animals. Without going into a dissertation on the mineral composition of plants and animals, let it be stated that calcium, phosphorus, potassium, magnesium, sulphur and iron are possibly the most important elements as found in the plant and as required by the animal body.

Of these, calcium and phosphorus are of prime importance, and mainly through lack of these, unsatisfactory conditions (as caused by mineral deficiency) are found in live stock.

Under ordinary conditions, as already stated, where the ration has fair variety and adequate quantities are fed, there is little danger of lack of mineral. The results of feeding ill balanced rations, insufficiently supplied, cannot be overcome by feeding supplementary mineral mixtures. Correct feeding of the soil, the featuring of leguminous crops (clover and alfalfa), the following of good feeding practice and the regular supplying of common salt, all are important in this connection.

Nevertheless, the use of mineral supplements is in many cases, good practice, particularly with dairy cattle, pigs, and pregnant or nursing females generally. With the latter a ration high in lime and phosphorus is required. Then, too, the nature of the feeds available may make necessary certain mineral additions to the ration. For example, some of the common feeds low in lime or calcium and calcium phosphate are straw and chaff, cereals and their by-products and roots. On the other hand, feeds high in lime are, hay from legumes, alfalfa in particular, certain grasses and many of the leguminous seeds. The small grains, wheat bran, malt sprouts, brewers' grains, linseed meal, etc., are all high in phosphoric acid.

The following figures are significant, as disclosing ***the calcium content*** on a dry matter basis of certain roughages: ***alfalfa 2.5 per cent***, red clover, 1.58 per cent; timothy hay, .39 per cent; corn stover, .41 per cent; oat straw, .36 per cent; wheat straw, .22 per cent.

From the foregoing brief comments, it would appear that, within certain limits, the feeder may control the mineral constituents of his live stock rations through the feeds he grows and uses.

There follows a brief discussion of mineral constituents as applying to the ration of the different classes of stock.

Horses.—Show fewer conditions attributable to mineral deficiency than other kinds of farm stock.

1. Salt regularly.

2. Ground or pulverized charcoal may be very useful. Feeding a handful or two during the week in grain or mash supplies phosphates and a good digestant at the same time.

3. Lime may be needed in some districts, and may be administered as ground lime stone in feed or as in lime water in the drinking water.

4. Potassium iodide crystals administered at the rate of one-eigth of an ounce (one small teaspoon, level) on the first and fifteenth of each month, dissolved in drinking water, would appear highly beneficial in the case of infoal mares as a preventive to joint ill and weakness in foals. Start administering this in November with the spring-bred mare.

Cattle.—Very frequently are insufficiently supplied with minerals, particularly high-producing dairy cows.

1. Feed a well balanced ration, making the feeding of leguminous roughages (alfalfa if possible) a feature.

2. *Supply salt regularly.* Iodized salt has special virtues. It may be purchased in block form or made up —two to four ounces potassium iodide dissolved in water and sprinkled over one hundred pounds of dry salt. Mix thoroughly.

3. ***Edible bone meal*** (not fertilzer) or bone char, where it may be secured, forms an excellent source of bone phosphate. Feeding a pound to a pound and a half per hundred pounds meal is good practice and may effectively supplement the heavy demands of the high-producing cow.

Where cattle show an abnormal or depraved appetite for bones, wood, etc., the result of deficient ration, this condition may be gradually corrected by the use of a mixture of bone meal, ground charcoal and salt. Further, there is considerable evidence pointing towards the probability of assistance from supplementary bone meal feeding in the matter of abortion infection control. If so, this must come through the strengthening or toning of the system generally and the genital organs in particular,

4. ***Pulverized charcoal*** or chick size charcoal may be fed to advantage, one and one-half to two pounds per hundredweight of meal. Charcoal is high in phosphates and is a good absorbent and cleanser for the intestinal tract.

5. ***Lime*** is best fed to cattle through leguminous roughages. It may be fed in the form of ground limestone with salt or mixed in the meal.

Finally, no amount of mineral mixture, bone meal, phosphates or lime, will greatly change the condition of the underfed "straw stack" cows, so common. The major consideration in Canada is ***better feeding,*** particularly as applied to calves, growing stock ***and dry cows.***

Sheep.—With one notable exception, sheep, as a rule, have not received or seemed to need the attention given other classes of stock in regard to mineral. Subsisting largely on pasture and hay or roughage crops and having access to the earth itself, their demands seem to be met with a plentiful and continual supply of salt, preferably rock salt.

Of late years, the practice of feeding iodized salt has become common, particularly in Western Canada and in districts where goitre is prevalent. The administration of minute quantities of iodine to the pregnant ewe will control goitre. As pointed out, iodized salt may be purchased in block form or may be made up as already described. The optimum quantity of potassium iodide for use in this connection is not definitely established as yet. From two to four ounces per hundred pounds of salt would seem to give satisfactory results. Thorough mixing is necessary.

A fair proportion of leguminous roughages is just as valuable, as with other classes of stock.

Swine.—The growth of the pig is the most rapid of all farm animals. Frequently the sow produces two litters per year. Therefore, the demand for lime, bone phosphates, etc., is heavy, and not infrequently poorly supplied by the feeder. There is no doubt but that more attention

to mineral supply would result in stronger litters, greater certainty in breeding operations, and better developed frames in market pigs.

1. Alfalfa or clover hay should be before the brood sow all winter.

2. The same roughages are good for winter fed market pigs.

3. Sods form one of the cheapest and best forms of mineral matter for winter use.

4. Tankage or meat meal, 3 to 5 per cent. for the brood sow and up to 10 per cent. for the feeder hog where no milk is fed, supplies soluble mineral salts.

5. Bone meal, ground limestone and charcoal make valuable additions to the meal ration of the brood sow or growing pig in many cases. One pound of each per hundredweight of meal may be enough. Edible bone meal is especially good for the brood sow, as is a small quantity of tankage (3 lb. per cwt. of meal).

6. Where hairless litters are prevalent or feared, potassium iodide is a reliable preventive. Make a stock solution of one ounce of potassium iodide to one gallon of water and give one tablespoonful of the solution to the sow daily in her slop during the greater part of pregnancy. Aside from preventive powers toward hairless litters and kindred conditions, such practice seems to exert a generally beneficial effect on litters.

Finally, in the foregoing discussion it has been impossible to stress the importance of good feeding practice. In Canada, as a rule, poor results with live stock are not directly attributable to lack of mineral in the ration. There are, of course, definite exceptions to this rule. Using the right kind of feed and enough of it to fit the age, kind and condition of the animal is of primary importance.

SOME ROUGH NOTES ON COCONUTS.

By Edgar Beckett, F.L.S.

When one considers the permanent nature of this crop, it is astonishing what little care is given by local growers to points of extreme importance before venturing on planting.

Throughout the whole Colony one sees bad types of trees, diseases of the stem and terminal bud, diseases of the leaves, stems undeveloped and also severely hacked, whilst during certain periods the ravages made by the caterpillar of ***Brassolis sophorae*** are a marked feature in coconut districts.

Little or no attempt appears to have been made in connexion with seed selection, and correct spacing in most instances has been ignored, whilst beyond brushing down weeds and bush, no cultivation whatever is practised. It is surprising what good crops sometimes are produced in spite of the absolute neglect that is so apparent.

The Coconut palm readily responds to any help that is given it. Usually palms are left to take care of themselves and often it is a case of the survival of the fittest. A little weeding around is given three times, or less, during a year and the young palms are expected to develop into strong and healthy trees, giving good crops. In a colony like ours where no implemental tillage is carried out on coconut plantations, it is to be expected that the growth of weeds can quickly smother a young cultivation of palms. The mere weeding of the surface is the common practise, but this is not of very much use. In most of our coast soils, the fertility is on the surface. It follows, therefore that the roots of the palm have a tendency to come to the surface, and frequently the rough, so-called weeding given, acts as a shock to the whole surface-feeding root system, since there is no actual breaking of the soil at all. Such weeding is not cultivation, and sometimes, if no mulching is practised, intensifies the ill effects of drought and the heat of the sun's rays.

Trees should be forked around with the operator's back to the stem so as to allow of the roots spreading.

The drainage afforded, must be better even than that of a sugar estate, in first-class order, and every effort must be made to give the young palms, by aerating the soil, an opportunity of securing a good and deep root-system.

It will be necessary to form a sanitary gang whose duties should be to keep a constant look-out for the coconut beetle and other well-known pests. This gang should also report at once the presence or even the suspicion of any disease.

An enormous amount of what may be termed mechanical damage, is done to coconut palms in this colony. Labourers think nothing at all of cutting notches in the trunk, sometimes to facilitate the climbing of the palm, and sometimes out of sheer wanton worthlessness. Also in the picking of the nuts, considerable damage frequently occurs, through mere carelessness, to young fruit and to the crowns of the palms. It is obvious that when injuries, such as these, are inflicted there is an excellent opportunity afforded for pests and diseases to gain an entrance. One has but to look at a number of our old palms to see the ravages made by the larvae of the large *Castnia daedalus.*

In Trinidad, very great care is exercised in the gathering of nuts. The operator has a rope around his waist so that he never actually enters into the tree and is able to slip all round the crown with both hands free. He is provided with a special implement for this purpose, one of far superiority to the local cutlass, which performs so many duties, both useful and otherwise, in the hands of our local agriculturists.

This tool is about the length of our cutlass, but has a sharp cutting edge on both sides and a broad cutting edge at the end, so that, nuts, with a thrusting upward blow, can easily be severed. The advantage of this is, that, only ripe nuts are picked, and there is no damage done to young fruit or flowering branches.

Local "pickers" usually climb into the crown of the palm, and with their feet, kick at "trusses" of fruit, which method often does considerable damage to flowers

and young fruit. When it is remembered that, it takes some 364 days before the nut, from the time the flower has been fertilised, to become fully ripe, it will be seen what an enormous wastage can occur.

It is a mistake to think that it is a point of sanitation, to remove hanging leaves, to clean the crown, and remove the "strainers" or fibrous stipules. It is very much better to leave this to Nature. The undue removal of all dead matter exposes the soft wood underneath, and renders the palm more liable to insect and other attacks.

Farmers in this Colony adopt many weird practices in order to get rid of the Rhinoceros beetle (*Oryctes* species) which is so often a menace to young trees. The method adopted by the writer was to soak rags of cloth in carbon-bisulphide, and to push this into the hole and ram and seal the hole with wet clay. This proved very effective.

Sanitation should be directed towards the fields themselves—no debris of rotting leaves and stems should be allowed to accumulate and harbour pests. Fields should be systematically cleared and debris burnt off as a matter of routine.

The use of fire should be undertaken with care. Frequently one sees in this Colony, damage of quite a severe nature, as the result of the careless use of fire, in a cultivation of palms.

With regard to the attacks of ***Brassolis sophorae***, a special gang should be kept, in districts where these pests are prevalent, whose duty should be to destroy the nests of these at their very first appearance. The old adage that "Prevention is better than Cure" is as true to-day as it ever was. The writer by keeping an extremely sharp look out for this pest, and nipping the attacks in the bud, was able to keep an extensive cultivation free of this pest, though neighbouring plantations suffered severely.

Coconut growers may rest assured that the care and attention given by sugar planters to their cultivation is not done for any reason other than the fact that they know by experience that it pays to do so. If so much care is necessary for a grass, for after all the sugar cane is a grass, how much

more necessary is it that a coconut cultivation should be treated seriously and proper cultural methods carried out.

If good sound nuts are to be obtained, if healthy palms are to be grown giving maximum yields, attention must be given to every detail of cultivation, quite as much if not more so, as in the case with a sugar plantation.

It is far better to have a small cultivation giving excellent returns than to have large areas with diseased trees dying here and there and getting a paltry average yield of some 18 to 20 nuts.

A tree which is said to provide everything necessary for life, which lives and produces fruit for such a number of years, is worthy of far greater care and attention than is given in this Colony.

If one considers the absolute lack of cultivation that this palm receives at the hands of our local growers, and what results are obtained in spite of this neglect, it can readily be conceived what a flourishing industry this palm could provide if proper cultural methods were in existence and care and thought given to its cultivation.

We plead with our farmers to take this matter seriously, to make use of the services of the Agricultural Instructors of the Department of Science and Agriculture.

MEETING OF THE BOARD OF AGRICULTURE.

A Meeting of the Board of Agriculture was held in the Committee Rooms, at the Public Buildings, on Friday, 24th day of September, 1926 at 2.30 p.m. The following were present :—W. Francis Esq., F.I.C., (Acting Director of Science and Agriculture), Chairman; Dr. C. L. Whittles, B.A., (Superintendent, B. G. Sugar Planters Experiment Stations); E. M. Walcott, Esq., F.R.; Thomas Earle Esq., G. E. Anderson Esq., (President, Royal Agricultural and Commercial Society); Captain E. Beckett; F.L.S., H. A. Britton Esq., (President, B. G. Farmers' Conference); Dr. F. Wills, C. R. Williams Esq., G. L. B. Gall Esq., (Director of Co-operative Societies), with E. M. Peterkin Esq., Secretary. The Acting Government Veterinary Surgeon, Dr. S. N. Bruce, was also present.

Excuses were tendered on behalf of the Hon. R. E. Brassington, S. H. Bayley, Esq., the Hon. G. D. Bayley, the Hon. J. J. DaSilva and the Government Economic Biologist.

The minutes of the previous meeting held on the 26th of May, 1926, having been circulated to the members of the Board and having received their approval, were on the motion of the Chairman seconded by Dr. Whittles taken as read and confirmed.

The minutes of the meeting held on Thursday, 29th July, 1926, for the purpose of inspecting the Gardens were read and confirmed.

The Chairman reported :—

The appointment of Mr. G. L. B. Gall, Director of Co-operative Societies as a member of the Board.

The affiliation of the Victoria-Belfield Agricultural Society.

The affiliation of the Plaisance-Sparendaam Agricultural Association.

The affiliation of the British Guiana Farmers' Conference.

The disposal of the Shorthorn bull, "Francis," at auction for $60.00.

The death of the Holstein bull "Texas Wonder."

Mr. Walcott proposed seconded by Mr. G. E. Anderson that Dr. A. M. Fulton, Veterinary Surgeon, be appointed a co-optative member of the Live Stock and Veterinary Committees. This was carried unanimously.

An application for two months' leave of absence from Mr. H. L. Humphrys was granted.

The Chairman laid on the table :—

The Journal of the Board of Agriculture, Volume XIX. No. 3.

A report on "Kosters Curse," Clidemia hirta, Don., by the Assistant Botanist and Mycologist.

The Chairman exhibited specimens of Antidesma in flower and fruit, and informed the Board that the authorities at Kew had identified the specimen sent them as Ghesaembilla and not Venosum, and read a note by Mr. Altson pointing out that its history published as Venosum was incorrect, and giving data as to its introduction, etc.

Mr. Anderson said that the history of the plant was not important. It was useless to send warnings to estates to take steps to get rid of this pest in their cultivations, as long as the Cemetery and the Botanic Gardens remained as sources of infection. Mr. Britton thought they should make some definite recommendation to the Government to have the pest eradicated.

Dr. Whittles reported that he had found some growing in his compound at Vlissengen Road, which was heavily impregnated with salt; and was of the opinion that it could grow anywhere.

The Chairman said he had submitted a report to the Government on the subject, suggesting the clearing of the Gardens and the D'Urban Park of the pest.

Mr. Britton moved :—

"That the Board view with great alarm the rapid
"spread of Antidesma and strongly recommend to the
"Government the pressing necessity for immediate steps
"to be taken for its eradication; and further urge that
"legislation be introduced to meet the situation."

Dr. Whittles seconded and the motion was carried.

The question as to whether legislation be enforced to prohibit the cultivation of Indian Corn in near proximity to Sugar Cane was discussed.

Dr. Whittles said that there were some canes at Sophia that in his opinion were suffering from Mosaic, he differed in opinion from the technical officers of the Department of Science and Agriculture, as to the presence of Mosaic in the Colony ; and he considered it important to reduce the chances of infection to a minimum. The precautionary measure would prove of great value.

Mr. Anderson said that if the disease was present at Sophia it should be notified officially ; the Secretary was instructed to notify the Government Mycologist and to ask him to report on same. After some discussion, it was decided to leave the matter over to be dealt with by the new Director of Science and Agriculture, who is an eminent plant pathologist.

Questions and motion by Mr. H. A. Britton, President, British Guiana Farmers' Conference.

Questions :—

1. Whether or not the Department of Science and Agriculture will consider the advisability of undertaking at once a survey and analysis of the soil of the coastal belts of the Colony, with a view to advising the small farmers, regarding the kind of crops that can be profitably cultivated on the soils in their respective districts. ?

Mr. Walcott said he knew that the Agricultural Instructors sent samples of soil to be examined. They should inform the Associations that farmers could have samples of soil examined, by applying to the District Agricultural Instructors.

2. Will the Director, save and except there be valid grounds and good reasons to the contrary, appoint and have among the several Committees of the Board, a purely Agricultural Committee.

The Chairman said he thought there should be a purely Agricultural Committee.

Mr. Walcott pointed out that a committee to deal with purely agricultural matters should be a Committee comprised of agriculturists.

3. Are there in existence any rules governing farming competitions among members of Associations affiliated to this Board; if none exist, will the Director undertake to draft such rules for approval?

The Chairman said there were no rules, but each Association framed its own.

The Secretary stated that the only people who could compete were members of the District Affiliated Associations.

Dr. Whittles suggested the adoption of the rules of Farmers' Competitions of the Royal Agricultural Society of England. This was approved of.

Motion :—

"That this Board recommend to Government the "advisability of their nominating Mr. D.D. Haynes for "another term, and thus enable him to complete the full "three-year Diploma Course at the Imperial College of "Tropical Agriculture; and further that this Board re-"commend to the Combined Court the granting of $500 "to Mr. Haynes."

Mr. Anderson, in seconding the motion, said he felt that having spent money on Mr. Haynes and his having reached the stage mentioned, it would be a waste of money not to permit him to complete the course.

Mr. Walcott said he would like to know what was the result of the last examination. The Board and the Government should know what progress Mr. Haynes was making.

The Chairman said that this matter of Mr. Haynes was being considered by the Government.

Mr. Walcott suggested that they might make the recommendation subject to Mr. Haynes having passed his last examination. This was carried.

The Chairman then adjourned the meeting to a date in January to be fixed later.

THE CULTIVATION OF TOBACCO.

By T. A. Archer,
District Agricultural Instructor.

Tobacco plants grow from seeds which are very much smaller in size than mustard seeds.

The seeds are often sown on nursery beds, when the cultivation is to be somewhat extensive, and in well-prepared boxes, if only a small plot is to be attempted. They take from five to seven days to germinate under good conditions, but many more days when conditions are unsuitable.

The plantlets are to be carried to the field when they are seven and eight weeks old, by which time they will be about three or four inches in height. After the ninth week the remaining plants will be too old and will not do well if planted.

While the tobacco plants, when once they are well established on good soil and under favourable atmospheric conditions, are fairly hardy, they are not so in their earlier stages. At this period the young, tender plants need the most careful attention. Even then, from ten to thirty per cent. of the number planted out often die, or are destroyed by worms or crickets. To meet this contingency, 50 per cent. more plants should always be estimated for than would be actually needed to plant a given area. Failure to provide for this eventuality would be disastrous.

The nursery beds are to be kept scrupulously free of weeds or grass, and must be constantly watched and examined for the enemies of the plants. No known plant has more enemies than the tobacco plant, especially at the earlier stages. These enemies do not come as spies, but in battalions. They must be pursued, captured and destroyed summarily. Every reinforcement of them should be similarly dealt with.

With proper care, a crop can be reaped in the space of three months after the planting has been done. The second and third crops, or ratoons from the stools, will, with careful attention and proper cultivation, aided by a liberal supply of good farm-yard manure, be ready in 6 and 12 weeks respectively after the reaping of the first crop. After this, a general stumping and replanting will be advisable. The plants, as a rule, respond admirably well to manurial influences, and the grower should be very liberal to them in this respect. To set the seeds, a bed, six inches higher than the general level of the land, running north and south, should be made. It should be three feet wide. Its length to depend upon the amount of seedlings required, or the area to be put under cultivation. Select good seeds for sowing always before hand, and at same time decide the area to be planted. The land for this purpose should be very well ploughed and pulverized, removing all pebbles and hard lumps of earth. Now spread a good layer of dry twigs over the bed and permit it to remain for a week or ten days, and then burn off. This operation is for the purpose of ridding the prepared surface of any rank weed that will by this time be growing up. Now put on a good layer of well-cured farm-yard manure and mix well to a depth of three or four inches. Then mix one or two spoonfuls of selected seeds, according to the length of the bed to be sown, with slaked lime, or cornmeal in the proportion of one to six, and sprinkle evenly over the prepared surface, press down lightly with a flat smooth piece of board, water lightly and the sowing is done.

Now erect a suitable lean-to over the bed with the higher side looking east, and cover with coconut leaves. Water daily with a watering can, the holes on the nozzle of which must be very small, so as not to up-root the plant. Continue this operation, except when it rains, until the plants are removed to the field. The covering over the bed should be removed for a few hours every day, a week or two before the time for planting, in order to harden the plants by exposing them to the sun.

How the Planting is Done.

As the tobacco plants take the nature of garden plants, it is always advisable to make beds for them for the reason that they must be watered, when there is no rain, at least twice daily. The beds enable the watering to be done without trampling on the soil round and about the plants for the drains between them would be used as so many path-ways in which to walk while the watering is carried on. The beds, after a good, deep ploughing has been done, should be made four feet wide and at least 6 inches high, with a two-foot wide drain between every two of them. Any length of bed would do. Now make holes 12 inches in diameter, 3 feet apart on both sides of each bed six inches from the edges. Fill these holes, which should not be less than 5 inches deep, with well-cured farm-yard manure. Mix well together the earth with the manure and form hillocks in the centre of the mixture. Now make holes in the middle of these tiny hills with a piece of stick or the fore-finger and put in only the roots of the plants. Ram them very gently all round. Water them at once, and the planting is done.

It is better to plant in the evening time or during a cool, wet day. To insure success every plant put down should be sheltered for a few days. Keep the plants clean, and mould them in the shape of a whorl, when moulding is needed.

How to Remove the Plants.

The nursery beds must be well watered about ten minutesor so before the planting commences, so as to soften the earth, thus permitting the removal of the plants with as little hold of injury to their tiny roots as possible. Now take hold of the plants one by one, with the thumb and index finger of one hand and pull gently by slight, jerking motions until the number of plants required are removed. Do not handle the tiny roots, but shake gently all the earth from them that you possibly can before planting them.

Soil.

A rich loam is best for the plants. Heavy clay is not good, nor are sandy and calcareous soils. A sandy loam rich in vegetable matter will also do.

Drainage and Tillage.

These must be very good in order to secure the well-being of the plants. A good water supply is indispensable.

Harvesting.

As all the leaves of the tobacco trees do not mature together, reaping will perforce go on for some time before the final cutting down of the trees takes place. The ripe leaves are gathered as they appear from time to time and taken to the drying-house. The ripe or matured leaves exhibit the following characteristic features :—they curl, are sticky to the touch ; have yellowish spots on the surface of the leaf-blades and when the tips of them are suddenly bent they break with a sharp cracking sound.

Topping.

This is the term used for nipping off the tobacco blossoms as soon as they appear. The *object of this operation* is to arrest the fruit-bearing energy, and divert it towards the foliage.

Disbudding.

After topping the plant, the dormant buds, at the axils of the leaves, which by the way, are alternate, sessile and hairy, will start to grow rapidly. These are to be removed constantly, or the energy arrested from the blossoms will go into the young shoots instead of the leaves for which it was intended and the crop would be spoiled to a great extent. Care should be taken to leave a few robust trees untopped, so as to secure seeds for future planting.

When all the upper leaves of the plants are ripe all the plants are cut down with a sharp implement to within 4 inches of the bases of the trees. The ratoon, if any, should not be damaged. Three or two, according to the

strength of the stools, of the most promising ones, should be left on each stool.

How the Drying is Done.

The leaves are hung in pairs three or four inches apart when they reach the drying house.

When reaped in the field, both trees and leaves must be left to wither for some time before they are removed to the drying house. They will become somewhat tough, and will not so easily break when handled in transit. The tree should be suspended singly. The leaves should barely touch one another. The distance apart in this case depends on the size of the leaves on the trees. In 30 or 35 days the mid-ribs of the leaves will be quite dry. The leaves must now be put through the fermenting process, which is the most important of all, since, if it be not properly done, the whole crop will be good for nothing

How to Ferment the Leaves.

Strip the leaves off the stems and separate the fillers from the wrappers. Open them evenly and place them one on the other on different piles, on a suitable platform, with their tails all in the same direction. Cover the piles with dry banana leaves thickly. Then cover these with clean sacks, and put on heavy weights over them. After 24 hours the heaps must be broken up properly to allow the leaves that were in the middle to get to the top and those that were on the top to get to the bottom and those from the bottom to get to the middle. Repeat this operation for three successive days and after, at intervals of two or three days for 30 days, when all the heat will have passed off and the necessary chemical changes taken place.

Select a cool moist day for this work.

Worming.

In the drying house great care must be taken with the leaves. The voracious sphinx moth caterpillars often play havoc with the leaves. By keeping the floor of the house clean always, the droppings from them would be

easily seen, and their exact position discovered. They must be hand-picked and destroyed. They must be looked for at least twice a day.

THE DRYING HOUSE.

This should be well constructed with doors and windows. The frames for the leaves and trees should run across the building in tiers one above the other, with a clear space of four feet between any two tiers in order to facilitate attention to the leaves. Accordingly the building must be of fair altitude, and good dimensions, which are factors productive of good ventilation. With bad ventilation the mid-ribs of the leaves will sponge and finally the leaves. Mildew, too, grows rapidly in badly ventilated places especially in wet weather, so that all this should be borne in mind when constructing a drying house for tobacco.

Finally, after the fermenting process is over, the piles of tobaaco must now be broken up and made into hands.

This is the term used for tying together, with an unsound leaf, the heads of from 12 to 30 leaves. The hands are then well packed into air-tight chests or barrles, using much force in the operation in order to exclude all the air possible. Cover the vessels hermetically and the product is ready for the market, or it can be kept indefinitely.

EXPORTS OF AGRICULTURAL AND FOREST PRODUCTS.

Below will be found a list of the Agricultural and Forest Products of the Colony exported during the first nine months of 1926.

The corresponding figures for the same period during previous years, and the average for the same period for eight years previous to that are added for convenience of comparison.

Product.	*Average 1916-23.*	*1924.*	*1925.*	*1926.*
Balata, cwts. ...	4,432	5,174	4,872	4,794
Cattle-food (Molascuit) tons	1,006	644	861	540
Cacao, cwts. ...	84	None	None	None
Cattle, head ...	344	252	429	11
Charcoal, bags ...	35,940	31,502	22,653	24,945
Citrate of Lime, cwts.	214	None	None	None
Coconuts, thousands	1,795	1,257	963	562
Coconut Oil, gals. ...	14,919	17,405	20,815	15,431
Copra, cwts. ..	1,578	13,511	10,552	32,627
Coffee, cwts. ...	4,081	4,579	5,231	6,700
Essential Oil of Limes, gals. ...	255	90	90	228
Firewood, Wallaba, etc., tons	5,796	5,132	4,607	5,760
Gums, lbs. ...	2,224	708	477	1,232
Hides, No. .	4,746	7,174	7,620	7,039
Kola-nuts, cwts. ...	7	None	None	None
Lime Juice, gals. ...	5,754	3,361	5,474	2,511
Lumber, ft. ...	153,021	93,508	111,256	139,827
Molasses, gallons ...	44,972	302,046	527,272	954,854
Pigs, No. ...	243	270	688	411
Railway sleepers, No.	10,042	11,802	30,591	10,743
Rice, tons ...	6,730	2,557	4,880	1,770
Ricemeal, tons ...	57	None	None	None
Rubber, cwts. ...	73	3	24	218
Rum, gallons ...	1,870,084	641,149	900,693	603,729
Sheep, head ..	32	35	10	None
Shingles, thousands	1,652	932	1,202	1,049
Sugar, tons ..	57,074	51,520	59,500	57,195
Timber, cub. ft. ..	77,985	135,095	146,975	226,781

Meteorological Data—July—September 1926.

Recording Stations & Months.	Rain-fall. Total Inches.	NUMBER OF DAYS OF RAIN: Under ·10 Inch	·10 to ·50 Inch	·50 to 1.00 Inch	1.00 Inch to 2.00 Inches	Above 2.00 Inches	Total days.	Evaporation. Inches	Air Temperature and Humidity. Air Temp. Maximum.	Minimum.	Mean	Humidity.
Botanic Gardens.												
July ...	11·60	6	6	4	5	...	21	4·44	86·1	75·5	80·8	79
August ...	9.82	8	5	3	4	...	20	5·22	82·2	75·7	78·9	79
September	2·77	4	8	1	...	...	13	5·37	81·6	76·7	79·1	79
Totals	24·19	18	19	8	9	...	54	15·03				
Means.	...	...	...	...	...	...	...	...	83·3	75·9	79·6	79
Berbice Gardens.												
July ...	7·43	4	11	5	1	...	21	...	88·7	74·3	81·5	86
August ...	4·56	5	7	3	...	...	15	...	89·9	74·9	82·4	75
September	2·64	3	3	1	1	...	8	...	90·8	76·2	83·5	74
Totals	14·63	12	21	9	2	...	44	...				
Means.	...	...	...	...	...	...	...	...	89·8	75·1	82·5	79
Onder-nee												
July ..	10·23	2	6	2	6	...	16	...	88·0	73·0	80·5	..
August ...	7·00	...	5	...	5	...	10	...	89·0	74·0	81·5	..
September	·37	...	3	1	1	...	5	...	90·0	73·0	81·5	..
Totals	19·60	2	14	3	12	...	31	...				...
Means.	...	...	...	...	...	...	...	...	89·0	73·3	81·2	..
Morawhanna. N.W.D.												
July ...	16·29	3	10	7	1	3	24	...	...	...	...	..
August ...	8.28	2	13	7	1	...	23	...	...	...	...	...
September	6·79	3	12	3	1	...	19	...	...	...	...	..
Totals ...	31·36	8	35	17	3	3	66	...	...	...	...	...

ATTENDANCES AT THE DISTRICT GARDENS

Year.	Bourda.	Belfield, E. Coast.	Stanleytown, New Amsterdam.	Suddie, Essequibo.	Den Amstel.	Houston, E. Bank.	Wakenaam.	Total Attendances.
1912 ...	5,514	4,395	3,302	2,100	2,544	2,156	1,718	21,729
1913 ...	5,156	4,535	2,519	3,399	2,568	1,836	1,319	21,332
1914 ...	4,243	3,869	2,443	3,025	1,791	1,653	1,533	18,577
1915 ...	1,123	1,006	769	59	503	339	401	4,209
1916 ...	4,705	1,161	1,510	225	623	2,251	1,297	12,026
1917 ...	4,991	2,820	1,366	3,297	1,186	2,564	1,663	17,086
1918 ...	4,834	3,081	1,653	2,671	2,162	2,790	2,067	19,258
1919 ...	4,769	2,425	1,582	2,798	1,851	2,480	1,556	17,461
1920 ...	6,285	2,312	1,665	2,525	2,532	3,228	2,148	20,69[illegible]5
1921 ...	5,671	1,968	1,642	2,629	1,949	2,539	1,610	[illegible],008
1922 ...	3,557	1,841	1,105	1,593	1,525	1,522	1,3[illegible]7	12,950
923 ...	4,038	2,780	1,595	1,934	1,953	2,13[illegible]	1,951	16,388
924 ...	4,123	2,827	1,103	1,789	1,678	2,146	1,664	15,330
925	3,317	2,755	1,580	1,819	470	1,663	1,597	13,201
926								
st quarter	545	935	410	494		175	614	
nd quarter	363	561	321	432		225	379	
·d quarter	444	538	65	448		401	300	

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